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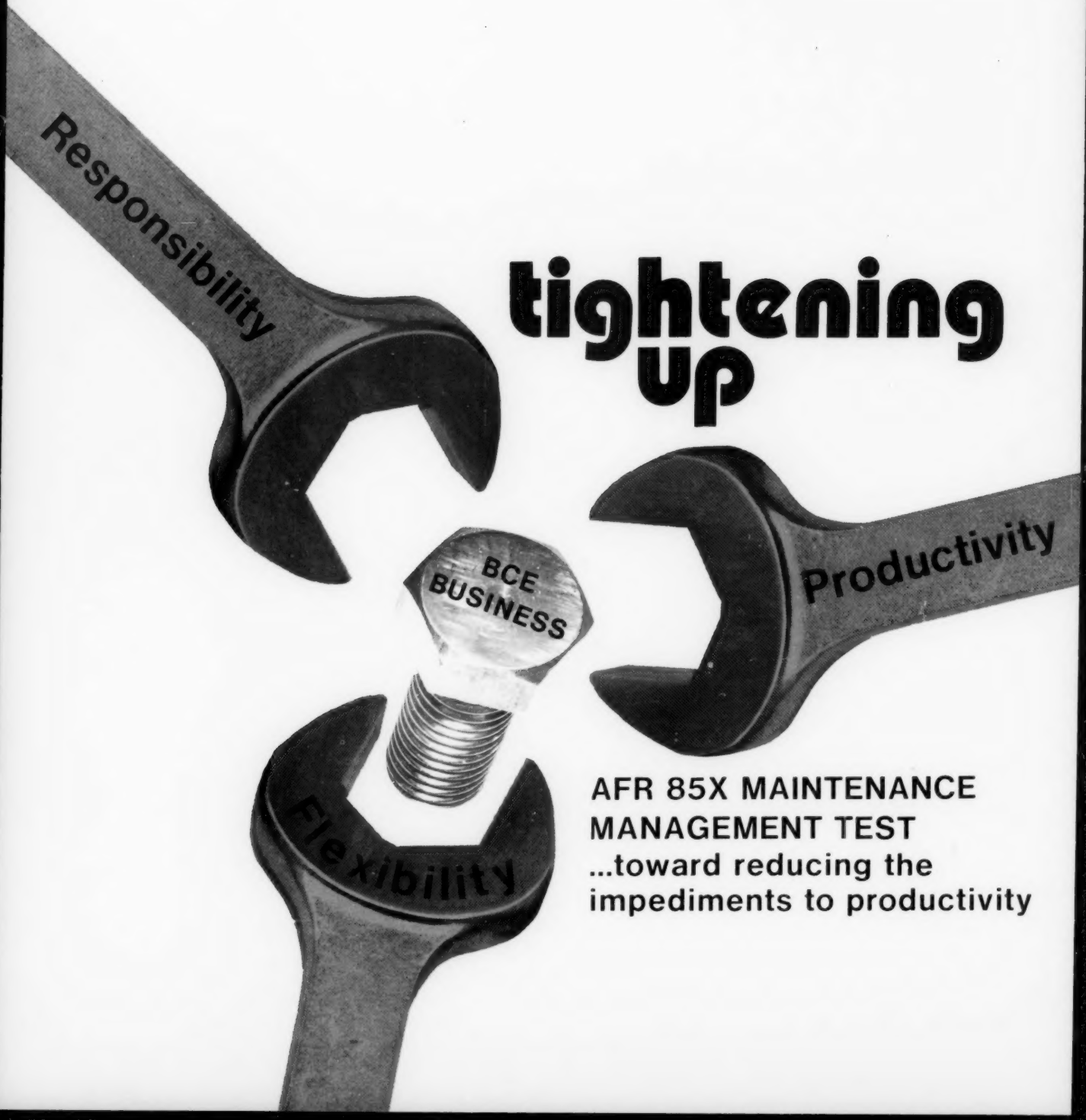


tightening up

AFR 85X MAINTENANCE MANAGEMENT TEST
...toward reducing the impediments to productivity

Maj Gen Robert C. Thompson
Director
Engineering & Services

From the Director

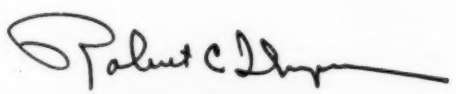
Keys to Success

In most businesses, customer confidence and satisfaction are the keys to success and there is no business where this is more certain than in Engineering and Services.

We probably have a greater impact on the "livability" of Air Force installations than any other organization in the Air Force. If our job is well done, literally thousands of people will live, work and play in a better environment. If the job is not well done, obviously, the result will be just the opposite. The point—how well Engineering and Services is perceived by others depends in great measure on the service we provide—and on our relations with those we serve. Therefore, in addition to doing the job correctly, we must practice good relations with our customers; those who communicate most with those we serve should be personable, relate well to others and be fully qualified to fill the customer relations role.

High on the list of people in key communicator positions would be the individuals who work at the Service Call Desk and the "Do It Now" truck mechanics as well as those who work behind the serving line and the cashiers in our dining halls. Everyone within the Engineering and Services organization performs in a customer relations role at some time and to some degree; however, the "key" positions are those with the most visibility and the most frequent contact with our customers.

I would like to know that regardless of an individual's position every person within our organization understands and practices good customer relations. This will naturally lead to customer confidence and satisfaction—the keys to success.



ROBERT C. THOMPSON
Major General, US Air Force
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IN THIS ISSUE

FEATURES

2 . **AFR 85X: Management Maintenance Test**
by Maj James E. McCarthy, PE, and Maj Charles B. Voss

6 . **Constructive Innovation in Food Service Systems**
by Col Norman D. Heidelbaugh

13 . **Projected End of Summer Positions**

16 . **CESMET: An Update**
by Col G. E. "Jud" Ellis

24 . **AFIT's Facilities Management Program**
by Lt Col Ronald E. Knipfer, PE, and Lt Col Patrick J. Sweeney, PE

26 . **The World of P341 Amortization**
by Capt John Q. Hill, Jr, PE

29 . **Good Quality in Roof Construction**
by Maj Richard H. Wyatt, PE, and Michael Toriello, EIT

32 . **Electricity from the Sun**
by Capt Anthony Eden, EIT, and Paul F. Neal, PE

35 . **Lessons Learned: Commissary Design & Construction**

37 . **Engineers Win 5 SAME Awards**

DEPARTMENTS

IFC . **From the Director**

11 . **Current Emphasis**

18 . **Counterpoint: Point**
MBO: Military Asset or Liability?
by Maj Harvey Manekofsky
MBO: Asset!
by Col Sheldon J. Lustig, AIP

23 . **Worth Noting**

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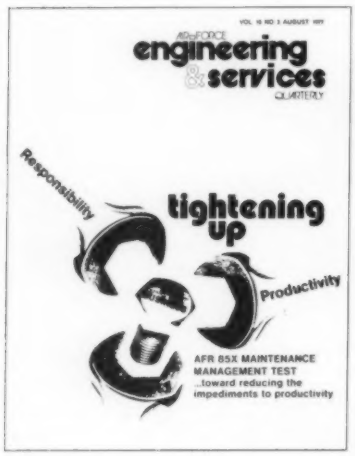
Flexibility...Productivity...Responsibility



AFR 85X Management Maintenance Test ...toward reducing the impediments to productivity

by Maj James E. McCarthy, PE, and Maj Charles B. Voss

A major test of new maintenance management procedures and functional realignment within Base Civil Engineering organizations is currently under way, representing the most significant change to occur in the Base Civil Engineering business in 10 years. It will ultimately impact all of Air Force Civil Engineering and, more importantly, the base communities that the Base Civil Engineer (BCE) supports.

The overall thrust of the Base Civil Engineering maintenance management test effort is to reduce the impediments to productivity so that the BCE can be more responsive and productive. The new procedures being tested focus on:

- **The Decision Process—faster and more efficient.**
- **Inefficient Procedures—simplify and centralize.**
- **Resource Availability—better use of people and things.**
- **Unnecessary Controls—identify and remove.**

A primary goal of the test is to provide the BCE organization with more discretionary authority and with it, more responsibility, to continue improving productivity.

Why Change?

The old procedures work because good people make them work! But these procedures require a high commitment in manpower and are often a deterrent, in themselves, to improved productivity. Too often, we find that our past efforts to thoroughly define the "best" ways to manage our business—through detailed, step-by-step procedural guidance in our regulations—have led to undesirable by-products: high overhead costs, loss of flexibility, inhibited innovation, and failure-to-comply-write-ups by the hundreds, to name a few.

At the same time, the dwindling resource problem continues to grow. The challenge to "do more with less" is not new. But a realistic look at the growing constraints on total civil engineering resources, particularly manpower, makes it more imperative than ever that we accelerate the search for better, more efficient ways to do business. This concern is coupled with a recognition that the BCE's role in the community is more than just "keeping things going." The BCE can achieve major initiatives to improve the livability of our Air Force bases. This capability must be supported with management procedures which allow the BCE to be more responsive and productive.

Test Development

The new maintenance management concepts evolved from a systematic analysis of each procedure and information system currently in use. Test planning participants came from all parts of Air Force Civil Engineering. Written recommendations were both formal, e.g., Air Force IG Reports, and informal, such as handwritten notes from shop people at several bases visited during concept development. Initially, 26 concepts were identified for further development.

In October 1976, 70 representatives from throughout the Air Force gathered at Biloxi, Mississippi, for three days to evaluate the concepts. This representative group of the civil engineering community recommended 24 of the original concepts and added five new concepts for Air Staff consideration. The specific results of the workshop, including written evaluations by each participant, were subsequently reviewed in detail.

In November 1976, a total of 21 concepts were approved for test implementation. These concepts are summarized in **Figure 1.**

The Book

The concepts were written into Air Force Test Regulation 85-X, which serves as **AFR 85-1,** Resources and Work Force Management, for the selected test bases. A task force from the Air Staff, major command headquarters, and several bases, completed **AFR 85-X** in early January 1977. This document and a test functional directive **(AFR 85-10)** are the management "bibles" for the test bases.

Compared to **AFR 85-1, AFR 85-X** is relatively small and provides a general framework for maintenance management. It avoids specifying detailed "How-Tos" and consequently permits a high degree of local flexibility for BCE organizations.

The Test

The test began in February 1977 at Keesler AFB, Mississippi, and Barksdale AFB, Louisiana, and at six other bases: Eglin, Hurlburt and Tyndall AFBs, Florida, Beale AFB, California, Plattsburgh AFB, New York, and Grand Forks AFB, North Dakota in March. Although test duration is planned for one year, interim evaluations by test bases and a steering committee of Air Staff and major command staff people **could result in early Air Force-wide implementation of any procedures that prove to be more effective and efficient than current methods.** Each of the procedures and functional alignments will be evaluated against the test objectives. The comments and recommendations of the test base participants will play a primary role in the evaluation process.

The Concepts

Each of the concepts being tested was designed to remove or reduce built-in impediments to productivity. To demonstrate, let's look at a few of the most significant concepts.

The Decision Process

The decision process can be a deterrent to productivity when work approval/disapproval is delayed. When disapproval decisions are tardy, customers are not only disappointed about the disapproval but can be justifiably annoyed about having to wait so long to learn of the "status." Delaying an approval decision often contributes to a squeeze in meeting the required completion date. These delays are often caused by the procedural guidance that BCEs must use.

Two features of **AFR 85-X** address this problem. The requirement to estimate all work requests, AF Forms 332, has been eliminated. This recognizes that for some requests, approval/disapproval can be determined without an estimate or "further reviews," and that to follow the book is just delaying the inevitable. **AFR 85-X** discourages routing requests throughout the organization unless it is essential for approval/disapproval. The people in each BCE organization determine locally how much processing is necessary.

Approval level itself can deter productivity. In **AFR 85-X,** BCE organizations are encouraged to use various options for work approval. The implication that the Facilities Board must see all minor construction work is removed so that authority can be decentralized and the decision process speeded. The test bases have responded in several ways. Most have delegated much of the installation commander's approval authority to the BCE organization. Several of the test bases have given significant approval authority to the Customer Service Representative. Moving the authority level lower in the organization has speeded the decision process and freed the BCE from an unnecessary administrative workload.

The test bases also use the "corporate review" process, e.g., the Facilities Board, to advise the installation commander on those work requests which are controversial or as an avenue of appeal for those customers who want disapproved requests reconsidered. The commander's update briefing is also used as a method of corporate review.

Figure 1: Management Improvement Concepts.

1. Central Processing Point.
2. Simplify IWP. Current plus one future month. Open competition among categories of work—remove "reserved" constraints.
3. Combine management of FAST and Service Call work.
4. More flexibility on work approval.
5. Combine work processing functions—organizationally.
6. Funds Manager process contract work orders.
7. SMART accomplish pre-SMART inspections.
8. Reduce number of Labor Utilization Codes.
9. Reduce a number of overhead work center codes.
10. Realistic warranty program.
11.* Reformat report of reimbursements and refunds.
12. Improve BEAMS for draft work orders.
13. Centralize handtool management in Material Control.
14. Simplify appliance management.
15.* Eliminate exception time accounting.
16.** RPIE replacement (over $1000) from O&M funds.
17.*Eliminate AF Form 1447, Manual Vehicle Costing.
18. Shop loading (no estimate) of FAST/HOPPER Job Orders.
19. Simplify real property capitalization.
20. Simplify self-help processing.
21. Eliminate "compliance" requirement for routine analysis of service calls.

* - Implemented as a permanent procedure Air Force-wide.
** - Not being tested - Air Staff is pursuing this initiative.

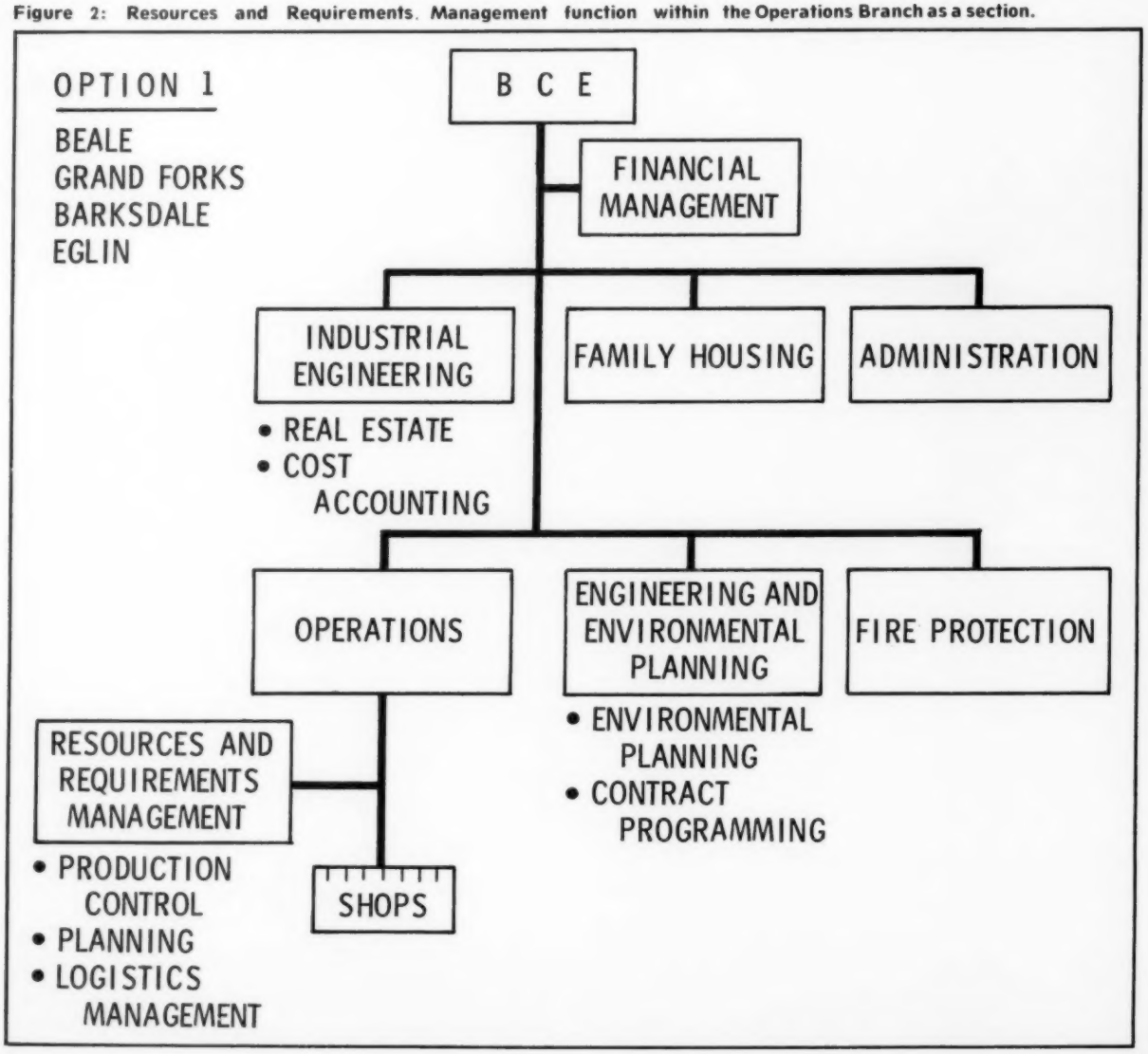
Each of the bases has decentralized approval authority, and has speeded and simplified the approval process. However, each base does it a little differently, based upon the capabilities of the people involved and the preferences of the installation commander. There is no universal "best" way. Bases are encouraged to find "the best" way for their local situation, remembering the need to be responsive in the decision process.

Single Point Processing

Put yourself in the customer's shoes and ponder for a moment what happens when you submit a request to the BCE for some work. Try to find out where it is, who has it, what's the status, when will it be done. Someone once estimated that a typical work requirement, from submittal of a work request through completion of the work order, makes stops in over 12 in-baskets and gets logged 16 times during its life cycle. The problem is compounded in real life by organizational "disconnects" between programs, operations and maintenance, and engineering and construction. It's often tough for the BCE himself to track down a requirement!

To counter this problem, concepts are being tested which consolidate the work processing functions totally within the Production Control Unit (PCU). This is the central point for receiving, scheduling and controlling the in-service work effort. The PCU contains the Customer Service Center, the single focal point for customer interface, preparation and receipt of requests for work, and status information. It is part of a new Branch concept under test—Resources and Requirements Management, which consolidates the service call,

Figure 2: Resources and Requirements Management function within the Operations Branch as a section.



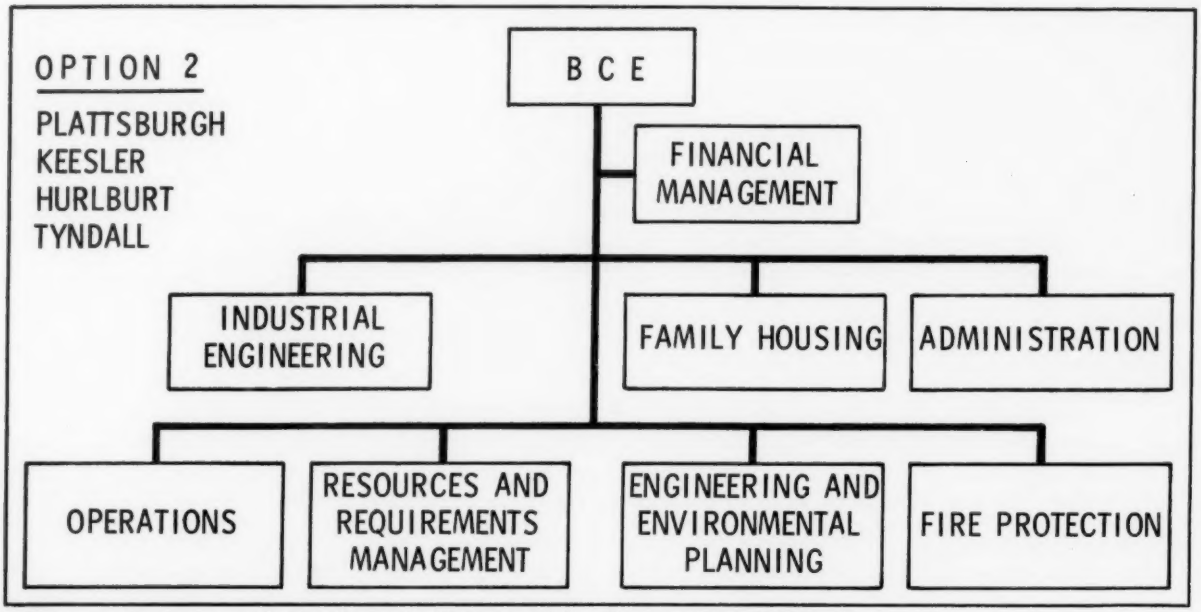


Figure 3: Resources and Requirements Management function as a separate branch.

controller and scheduling functions from the Operations and Maintenance Branch with the IWP Programming, Work Authorization, Planning, and Material Control functions from the Programs Branch. The intended result is cradle-to-grave control and processing of in-service work requirements.

Two organizational alignments for this new control unit are being tested. Option 1 places the Resources and Requirements Management function within the Operations Branch as a section, **Figure 2.** Option 2 establishes Resources and Requirements Management as a separate Branch, **Figure 3.**

Other functional realignments reflected in the test organization charts, **Figures 2 and 3,** are also based on the premise of functional continuity, and the need to bring information producers closer to information users. Contract programming, comprehensive planning, and environmental planning are consolidated with the Engineering and Construction functions in the new Engineering and Environmental Planning Branch. Real Estate and Cost Accounting are collocated in Industrial Engineering, and the Funds Management Function becomes a staff office reporting directly to the BCE.

Keep It Simple

Emphasis on **simplification** underlines almost all of the concepts being tested. While simple may not always be better, it is almost always faster, easier, more adaptable and flexible. The test includes simplified IWP procedures, elimination of a number of statistical compliance requirements, less restrictive self-help request procedures, simplified appliance management, reduced data gathering and reporting requirements, and streamlined work processing and control procedures.

AFR 85-X provides a general framework of new maintenance management procedures. The detailed how-tos are left to the experts, the people who know how to get a job done best with the resources they have, the people who work for the BCE.

(cont'd on page 10)

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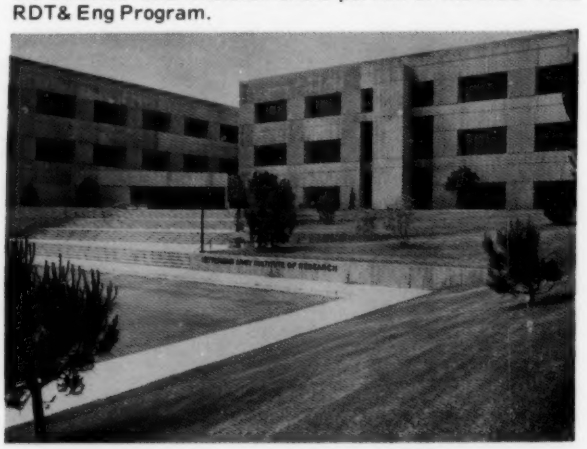
If you have ever wondered where new ideas originate for the operation of Air Force Food Service Systems, you may be surprised to know that they come from any level in every major command. One example is the a/la carte food system currently undergoing tests.

Food service technological problems are common to all military services. Hence, the Department of Defense (DOD) established a single Research, Development, Testing and Engineering (RDT& Eng) Program for foods (**AFR 80-52**). The Army is the executive agent for the DOD Food Program, and the performing laboratory for the food service and technology portions is the US Army Natick Research and Development Command (NARADCOM) at Natick, Massachusetts. Approximately 30 military and 275 civilian personnel work at NARADCOM on DOD Food RDT& Eng requirements supported by an annual budget of about $16 million. Approximately 19 percent of NARADCOM personnel hold doctorate degrees. The performing laboratory for the nutrition and wholesomeness portion of the program is the US Army Letterman Army Institute of Research (LAIR) at the Persidio in San Francisco, California. At LAIR, approximately 49 military and 37

US Army Natick Research and Development Command at Natick, Massachusetts, is the performing laboratory for the food service and technology portions of the DOD Food RDT& Eng Program.

The Letterman Army Institute of Research at the Persidio in San Francisco, California, is the performing laboratory for the nutrition and wholesomeness portion of the DOD Food RDT& Eng Program.



Ever hear of the US Army Natick Research and Development Center? Or the US Army Letterman Institute of Research? Read on to learn how these organizations play a significant part in the DOD Food, Research, Development, Testing and Engineering Program. Each year, the Air Force identifies, formulates, reviews and establishes a priority for its food requirements. It all adds up to . . .

CONSTRUCTIVE INNOVATION IN FOOD SERVICE SYSTEMS

by Col Norman D. Heidelbaugh

civilian personnel work on the DOD Food RDT& Eng with an annual budget of approximately $1.5 million. Approximately 28 percent of LAIR personnel hold doctorate degrees.

Every year, the Program requires each military service/agency (Air Force, Army, Navy, Marine Corps and Defense Logistics Agency (DLA)) to identify, formulate, review and establish a priority for its Food RDT& Eng requirements. The types of requirements which come within the scope of this program are shown in **Figure 1.** For most elements of the Air Force, the annual request for requirements is made by formal letter (usually in December) from the Directorate of Engineering and Services, Headquarters US Air Force, to each major command, requesting identification of Food Service RDT& Eng needs.

These requirements are reviewed and integrated into a DOD program by the Joint Technical Staff (JTS) consisting of members of the four military services and the DLA. The JTS version of the program is then reviewed and given a priority rating by the Joint Formulation Board composed of senior staff personnel from the four services, DLA and a representative for The Surgeons General. After approval by the Assistant Secretary of Defense for Research and Engineering, the program is carried out by either NARADCOM or LAIR. Each service has an officer assigned full time at NARADCOM to monitor that service's interest in the Program.

This Joint Service Food RDT& Eng Program has distinct advantages compared to each service attempting to perform its own food related program. Among the advantages are:

- **Avoidance of duplication of effort;**
- **Establishment of program control whereby each service is responsible to identify, define,**

Figure 1: Scope of RDT& Eng Program.

1. Nutritional RDT& Eng requirements, adequacy and wholesomeness of food under all conditions.
2. Food chemistry, physics, microbiology, macrobiology (insects and rodents), processing, preservation, packaging, stability, consumer acceptance and human factors psychology.
3. Food preparation, holding, serving and handling equipment.
4. Food service systems, materiel and facilities for all environments and all operating conditions.
5. Recipes, menus, operational rations and food packets.
6. Specifications data for food and related packaging, food service equipment and food service systems.
7. Verification testing of food and food service equipment as requested.
8. Production engineering to insure essential characteristics of subsistence items and food service equipment in or entering the supply system.
9. Food service personnel training and motivation.
10. Ration costs systems, cost control of food, total food service system costs.
11. Food service management systems, management information systems and cost-benefit analysis.

Figure 2: FY77 Air Force Requirements in Food RDT& Eng Program.

Priority Number	Requirement Title	Brief Objective
1.	Exploratory Development of USAF In-flight Food Packet.	To design a new IF Food Packet using the flexible package food developed for the Meal-Ready-to-Eat which is programmed to replace the food items in the metal can. Advantages: 1) reduced cost, 2) 5-year shelf life, 3) insect proof, 4) 25% lighter, 5) 6% reduction of value, 6) food variety increased, 7) food is better tasting.
2.	Exploratory Development of *Specialized Oven & Grill.*	1) provide necessary modification to current Bare Base Oven and Grill, 2) to develop a training program for bare base food service journal.
3.	Design and Test of New Food Service Concepts for Air Force.	To conduct operations research and systems analysis of various concepts of providing food service at base level (i.e., new combinations of food outlets, management, procurement, etc.)
4.	Menu Combination for Cash Food Service.	To develop menus composed of highest acceptable foods which will accommodate the various forms of cash a/la carte food service systems.
5.	Mechanical Meal Dispenser for Flight-line Feeding.	To provide at least five varieties of hot complete meals from a "vending machine" operation for "off-hours" and small volume food service—especially to meet needs of air crews in transit.
6.	Maintaining Microbiological Compliance While Introducing Novel Production Procedure for Missile-Site Food.	To update the food processing procedures at the central preparation facility for frozen meals for missile sites.
7.	Rapid Detection of Microbial Contamination in Missile-Site Food.	To provide a simple method for fast screening of food produced/procured for missile-site operations.
8.	Fast Food Service Module and Equipment.	To provide a continuing engineering update of fast food service module and "circular" food service systems.
9.	Precooked Meats for In-flight Feeding.	To develop rapidly rehydratable freeze-dried meat components for in-flight sandwich preparation.
10.	Rapid Thawing and Heating of Bulk Frozen Foods.	To provide Air Force with equipment for rapid tempering of frozen foods unique to Air Force food service operations.
11.	Prediction of Food Habit Changes in US Air Force.	To provide food service planners with insight into the food preference changes of the Air Force food service customer.

specify, cost, rate, schedule and monitor RDT& Eng requirements in food service;

- Maximize the relevance of research and development to service needs;
- Provide a mechanism for keeping accurate records of relationships between expenditures and achievements needed to verify budgetary requirements; and
- Enable DOD to establish a center of excellence for nutrition, wholesomeness, food science, technology and food engineering as well as food systems operations research and analysis.

The scope of the Air Force requirements in this program can be seen in **Figures 2 and 3.**

Some Accomplishments

Efforts are under way to upgrade the quality, convenience and shelf-life of Air Force in-flight food packets as well as reduce their cost. The data presented in **Figure 4** shows the high overall acceptability by Air Force personnel of the thermostabilized flexible packaged foods developed in this program for Army requirements to upgrade the Army's Meal, Combat, Individual to the Meal-Ready-to-Eat concept. A replacement for the current In-Flight Food Packet is desirable since this item has become costly due to the relatively small size of the procurement and relatively short shelf-life. It is anticipated that the in-flight thermostablilzed foods now packed in metal cans could be replaced by the new flexible-packed thermostabilized items. This gives the Air Force all the advantages of high quality, reduced weight and cube, excellent nutritional value, insect-proof package, and long shelf-life (hopefully up to five years). The reduced costs would be realized by the Air Force since procurements could be "piggy-backed" with the considerably larger lot purchases by the Army when the Army begins use of the flexible packet in its new Meal-Ready-to-Eat concept. A preliminary mock-up of this in-flight food packet is shown in **Figure 5.**

In the studies conducted at Travis AFB, California, under the DOD Food RDT& Eng Program, several innovations were evaluated. They included menu modifications, dining hall renovations, and the introduction of three new food service operations: a modular fast food unit; a flight line facility, and an ethnic, specialty meal service provided by one of the renovated dining halls.

The modular fast food service facility was designed and operated to:

- Locate a food service outlet convenient to potential customers;
- Offer high preference foods, prepared to order for take-out;
- Serve approximately 500 short-order meals over an extended period each day;
- Minimize total food and labor costs; and
- Provide access to adequate nutrition.

All of these objectives were achieved.

The flight line facility was designed and

Figure 3: FY78 Air Force Requirements in Food RDT& Eng Program

Priority Number	Requirement Title	Brief Objective
1.	Design of USAF Mobilization and Augmentation Food System.	To define a food service system which accommodates AF needs during mobilization and augmentation operations.
2.	Exploratory Development of USAF In-flight Food Packet.	Same objectives as FY77 requirement.
3.	Design and Test of New Food Service Concepts of AF.	Same Objectives as FY77 requirement.
4.	Maintaining Microbiological Compliance While Introducing Novel Production Procedures for Missile-Site Food.	Same Objectives as FY77 requirement.
5.	Rapid Detection of Microbial Contamination in Missile-Site Food.	Same objectives as FY77 requirement.
6.	Prediction of Food Habit Changes in USAF.	Same objectives as FY77 requirement.
7.	Fast Food Service Module and Equipment.	Same objectives as FY77 requirement.
8.	Mechanical Meal Dispenser for Flight-line Feeding.	Same objectives as FY77 requirement.
9.	Develop a Mechanized System for Cash/Credit Control in Dining Facilities.	Provide subject system.
10.	Improved Procedure for Procurement and Supply of Subsistence and Equipment.	Provide subject system.
11.	Develop an Automated System for Menu Planning, Costing, Recipes and Inventory.	Provide subject system.
12.	Prioritization of Dining Hall Modification on Basis of Costs and Customer Satisfaction.	To develop a trade-off matrix for local decision making in order to optimize investments in facilities modification.
13.	Automated System for Food Service Manpower/Workload Scheduling.	Provide subject system.

operated to be convenient to the customer; to offer a variety of high quality, hot meals, soups, sandwiches and other items in addition to the usually available boxed meals; and to provide prepared meals and other food items in individually portioned and packaged form to be consumed in the facility or taken to the work site. A number of advantages were provided by this concept and operation. In addition to offering the customer better service and higher quality foods than is possible when serving only box meals, a savings in manhours was achieved and costs were comparable to existing dining hall operation experience.

The specialty meal service was designed to meet the objectives of providing an alternative choice to the supper meal; offering popular, high preference ethnic and specialty food items and meals, providing for greater variety, and ensuring adequate nutritional levels consistent with established requirements; and serving approximately an additional 200 meals per day in the dining hall with a minimum increase in labor requirements. In general, all these objectives were successfully achieved.

Comprehensive work analysis, consumer evaluation, nutritional evaluation and attendance pattern studies were accomplished on all the innovations implemented at Travis AFB. The data from these studies has given the Air Force an insight into the implications of what such changes could mean for all Air Force food systems operations.

One fact that the Travis AFB studies proved beyond question and hopefully, once and for all, is that our customers are people, not numbers of rations to be fed, and not a percent attendance rate. We have been learning this slowly over the last few years as we went from steel trays to

Figure 4: Rating of Thermostabilized Flexible Packaged Foods for Proposed In-Flight Food Packet.

Factor	Rating	Turkey and Gravy	Meat Balls in Barbecue Sauce	Beef-steak	Beef Stew	Fruit Cake
Appearance	Good	8*	11	5	8	6
	Acceptable	3	0	6	3	5
	Poor	0	0	0	0	0
Texture	Desirable	11	11	11	11	9
	Undesirable	0	0	0	0	2
Flavor or	Excellent	1	5	1	1	4
Taste	Very good	6	4	5	3	2
	Good	3	1	4	7	4
	Fair	1	1	1	0	1
	Poor	0	0	0	0	0
Overall	Excellent	2	5	1	1	2
Acceptability	Very good	4	3	3	3	4
	Good	4	3	6	7	4
	Fair	1	0	1	0	0
	Poor	0	0	0	0	1

*Indicates number of panel members giving this rating. Total number in panel: 11

Figure 5: This mock-up of the prototype design of the in-flight food packet shows the use of flexible packages which replace metal cans.

ceramic dinnerware; from mess halls to dining halls; from sterile subsistence buildings to comfortable, carpeted dining areas; from mess sergeants to dining hall supervisors; and from unsystematic development support to the DOD RDT& Eng Program.

Certainly, one of the greatest concerns in the Air Force is the concern for its people. This nation depends upon its personnel to operate the most sophisticated defense weapon systems ever desired. Certainly, we must modernize our food systems to match the modernization of weapons systems and the sophistication of the training and experience of Air Force people. The Travis AFB studies have provided us some directions in order to implement such inevitable changes. Indeed, current concepts of future Air Force food service operations include the innovations of Travis AFB, and more—by also incorporating the displacement of the daily "issue/ration system" by a "cash a/la carte system" such as is generally found in the free enterprise sector of society.

While the Travis AFB study identified many customer desires, it also served to underscore the fact that enlightened management must come first. In the past, many management objectives have been derived from a "gut feeling." The Travis AFB studies definitized and systematically documented Air Force needs. What must **management** do? First, management is many people working at many levels. All must begin playing from the same sheet before real progress can be made. Management innovations can most effectively be implemented in these areas:

This fast food service module at Travis AFB, California, is located convenient to customers and offers high preference foods, prepared to order for take-out.

COLONEL HEIDELBAUGH *is assigned to HQ USAF/RDPS on duty as Representative, DOD Food Research, Development, Testing and Engineering Program at the US Army Natick R&D Command, Natick, Massachusetts. He holds masters' degrees in food technology and public health from MIT and Tulane. He has a doctorate in food science from MIT and is a doctor of veterinary medicine from the University of Pennsylvania.*

- Provide a management attitude that is responsive to changes, that is flexible and challenging in its approach to suggestions. Bases have a wide range of missions and capabilities, and management must satisfy all within the framework of the "system."
- Encourage and support a food service personnel system that recognizes and compensates the "fast burners," those with the talent and initiative to carry out difficult and complicated missions.
- Aggressively pursue, establish and implement work practices that will substantially increase food service productivity in the face of a system that sometimes seems to have been designed against productivity. We must materially increase the effectiveness of supervision while reducing the quantity of supervision, establish schedules that match workloads, use part-time help and staggered work hours.
- Implement effective training programs.
- Continue to actively seek out ways to improve our system at every level and be responsive to those ideas developed beyond our own fences.

Achievements by the DOD Food RDT& Eng Program show that it is possible to constructively innovate. This program shows the great potential for controlled and documented food systems experiments which, for the first time, have become widely available to all military services through the mechanism of the DOD Food RDT& Eng Program.

This program is beyond the "how-can-we-do-it" stage. We are beyond the "what-do-we-do" stage. We are in the "why-not" stage. If you have any ideas to better the Air Force food service programs, pass them along through channels. The DOD Food RDT& Eng Program is always seeking improvements. Why not? **E&S**

QUARTERLY WINS JOURNALISM AWARD

The **Air Force Engineering & Services Quarterly** was named a winner in the 14th Annual National Association of Government Communicators (NAGC) awards contest held in Washington DC on 15 June.

George K. Dimitroff, Editor, and Dean M. Spencer, Art Editor, accepted the "Blue Pencil Award" for Outstanding Government Publications produced in 1976. The citation was presented by the NAGC president at the awards luncheon held at the Capitol Hill Quality Inn in Washington DC.

The contest, largest in the history of the NAGC, drew more than 440 entries from all agencies and departments of the Federal government as well as those from State, County and Municipal levels. There were 16 categories in the contest and the **Quarterly** placed third in the Technical Publications Category, more than one color, intended for the specialist. Judging was based on editorial content, layout and design.

The National Association of Government Communicators is a professional body of Federal, State, County and Local government writers, editors and information personnel whose responsibility is the advancement of communications as an essential professional resource at every level of government. It is headquartered in Washington.

AFR 85X Test *(cont'd from page 5)*

So How Is It Going?

In a word GREAT!—according to the people where the action is—the managers and the BCE people conducting the test. Notwithstanding a few rough edges, some start-up turbulence, and minor pockets of confusion (not enough guidance!), feedback from the test bases has been quite positive. More importantly, the dialogue between the test bases, the participating major commands and Headquarters US Air Force has remained open, objective and continuous. This participative test and evaluation process should help to insure that the management procedures that may ultimately be implemented Air Force-wide as better ways to do business, do in fact, provide the BCE with more flexibility, responsibility and productivity.

Directorate of Engineering and Services

Current Emphasis

brief commentary on significant developments

FY 1979 MILITARY CONSTRUCTION--The Air Staff is reviewing the FY 79 MCP. MAJCOMs submitted over $1.4 billion in requirements which must be squeezed into a $720 million ceiling.

OCCUPANCY RATE FOR AIR FORCE FAMILY HOUSING--was 98.37 percent for adequate and 98.65 percent for inadequate units during the period from 1 July 76 to 31 March 77. Air Force goals in AFR 90-6 are 99 and 95 percent, respectively. Turnaround times averaged 10.45 days for adequate and 7.75 days for inadequate units.

ENVIRONMENTAL PLANNING--The Air Force Civil Engineering Center (AFCEC) was recently transferred from AFSC to the Air Force Engineering & Services Agency. The Research and Development functions remained with AFSC and became Detachment 1, Civil and Environmental Engineering Development Office (CEEDO). Environics, formerly a Directorate of AFCEC is now part of the CEEDO activity. The Planning Division of the Directorate of Environics is now a full directorate in AFCEC. The research and development functions of Environics are now part of CEEDO.

COMMISSARY CONSTRUCTION/IMPROVEMENT PROGRAM--The Board of Directors of the Air Force Commissary Service recently approved an aggressive construction/improvement program. The program includes construction, alteration and minor construction projects, and a "quick fix" program to take care of minor deficiencies. The entire program of approximately $80 million will be financed by the Commissary Trust Revolving Fund.

VENDING FACILITY PROGRAM FOR THE BLIND--Effective 23 March 77, all DOD actions concerning facilities programming, design and construction must include consideration of a location for vending facilities for the blind. This rule applies to buildings acquired or substantially renovated that are occupied by 100 or more federal government employees and all buildings of 15,000 square feet or more that are visited by the public. The rule does not apply to projects in foreign countries.

AIR FORCE OCCUPATIONAL SAFETY AND HEALTH (AFOSH)--AFR 8-14 establishes these standards as the basic OSH requirements for the Air Force. In the absence of an AFOSH Standard, or any other Air Force guidance, the applicable OSHA Standard is to be used. If there is no applicable OSHA Standard, use any nationally recognized source of health and safety criteria.

SANITARY LANDFILLS--attract birds which are hazardous to aircraft. Accordingly, landfills located near airfields may be incompatible with safe flying operations. FAA Order 5200.5 provides the following guidance: Sanitary landfills will be considered as an incompatible use if located within 10,000 feet of any runway used or planned to be used by turbojet aircraft.

NEW FOOD SERVICE MANNING STANDARD--Major command manpower offices are currently in the process of applying the updated food service manning standard to determine its impact on Air Force food service manning. The new standard combines several food service work centers. Implementation of the standard is anticipated by the end of 1977. (continued next page)

PAVEMENT EVALUATION SPECIAL EXPERIENCE IDENTIFIER (SEI)-AFSC 55XX--HQ AFMPC has identified a new Pavement Evaluation SEI for inclusion in the April 78 update of AFR 36-1. Requirements for award of the new SEI will include 12 months experience at base level, working with pavement maintenance/design, and attendance at the AFIT Pavement Engineering Course. Selection for assignment to the AFCEC in airfield pavement evaluation work will give preference to officers holding this SEI.

BACHELOR HOUSING INITIATIVES--An Air Staff working group has identified several initiatives which are considered necessary to improve the livability of bachelor housing. The group's efforts will now center on developing specific recommendations for changes to Air Force and DOD standards and policies, with particular emphasis on adequacy standards.

MULTI-REGIONAL CALL CONTRACTS--The Civil Engineering Center's Environmental Planning Directorate does much of its actual investigational work through civilian contractors, who are contracted in advance for quick-response delivery of needed efforts. To increase responsiveness and familiarity with study areas, the Directorate is selecting new contractors in each of eight national regions for future environmental work.

BUILT-UP ROOF--REPLACE BY RETROFIT AND DESIGN--Due to continuing premature failure of flat or nearly flat built-up roof coverings, use of a sloped asphalt shingled roof should be considered in all cases where structure and span permit. New materials and methods of application permit the use of asphalt shingled roofs to slopes as low as 2 in 12. Sloped roofs give more options for architectural appearance and handle snow environments readily.

AIR FORCE FIRE PROTECTION NOW LOCATED AT TYNDALL AFB--A Directorate of Fire Protection has been established at the AFCEC, and HQ USAF Fire Protection functional responsibility was transferred to the Center 1 July 77. The new Directorate will include policy, fire teams and special actions divisions. Call AUTOVON 970-2296/2634 or (904) 283-2296/2634 for further information.

WEAPONS SYSTEM SECURITY IMPROVEMENT (WSSI) PROGRAM--The WSSI program is of high interest to both the Congress and the Air Force. Engineering managers are asked to provide their personal support to expedite the design and construction of these projects.

AFM 146-7, FOOD SERVICE MANAGEMENT--The long-awaited food service management publication (to become AFR 146-7) is receiving its final review prior to being sent to the printers. Extensive revisions have been made to this bible for food service managers.

PRIME BEEF CIVIC ACTION TEAM--The AFCEC has selected the next 9-man Prime BEEF Civic Action Team to continue work on the perimeter road project on Fefan Island, TRUK District, Trust Territories of the Pacific Islands. The eight month deployment will begin on 27 June 77. The 12 mile coral road which will facilitate farm-to-market transportation, was begun in January 75 and is scheduled for completion in May 78.

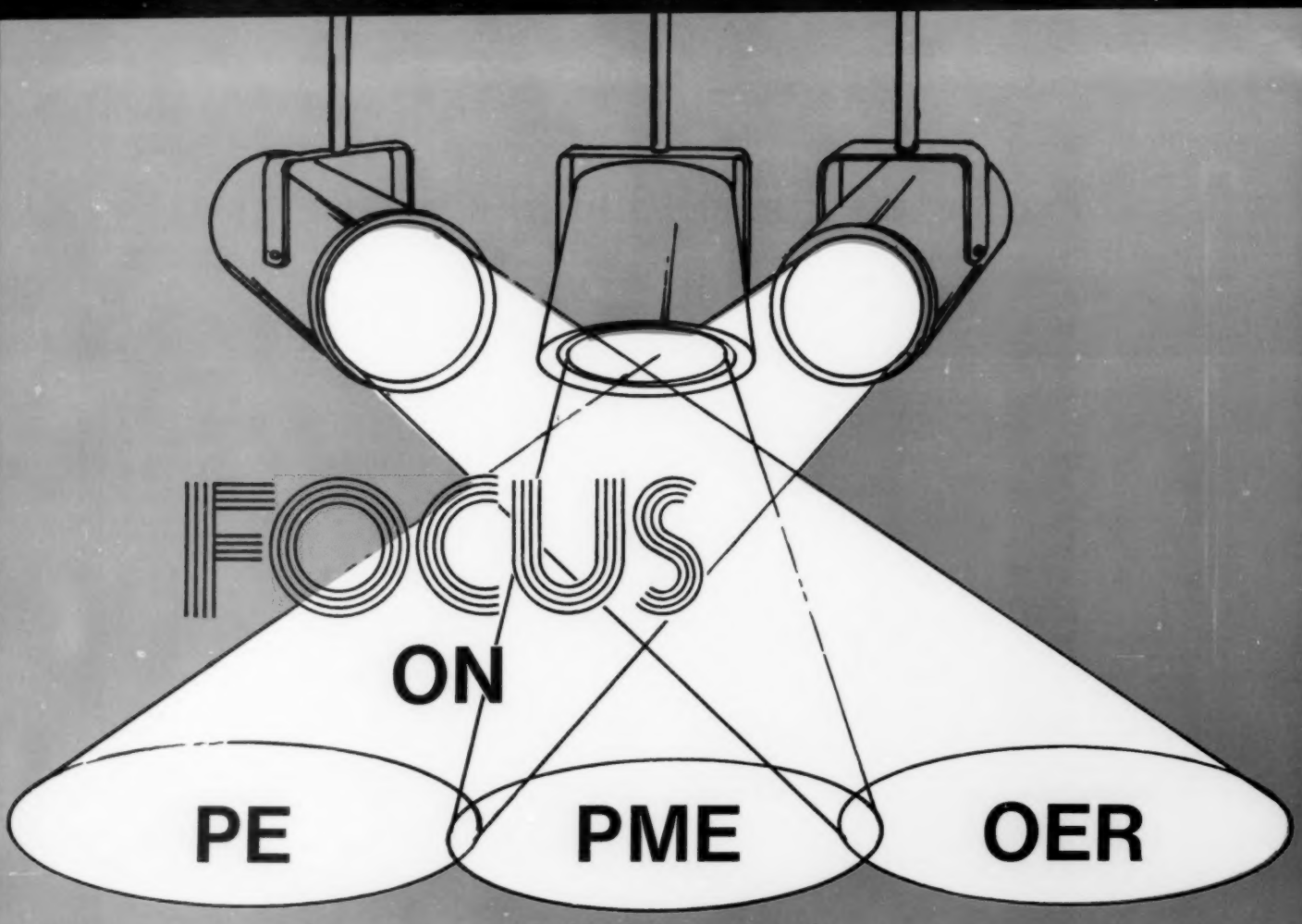
FOOD TEAMS TO INCREASE--The Air Force Services Office food management teams will soon be increased to 12 food service management experts. The result will be a greatly improved capability to respond to the needs of food service management.

Projected End of Summer Positions

The following list contains the names of colonels (and colonel selectees) and their current or projected positions (as of the end of August 1977). Because of early publisher deadlines, this list is current as of 1 June 1977. Some changes may have occurred since the list was submitted for publication.

NAME	POSITION
Ahearn, Joseph A.	USAF/PREN
Alkire, Melvin G.	USAFE/DE-2
Allison, Thayer W.	Eglin/BCE
Amerio, Umberto M.	Kadena/BCE
Atchley, Jimmy O.	Grand Forks/BCE
Beckwith, Wayne K.	ATC/DEP
Bohlen, George A.	Peterson/BCE
Bolton, Howard F.	AFLC/DE-2
Bond, Gerald E.	F.E. Warren/BCE
Borowski, Eugene C.	March/BCE
Brennecke, Harold J.	Little Rock/BCE
*Bruenner, William	USAFE/DEH
Bryant, Warren A.	Norton/BCE
Busick, Charles P.	Holloman/BCE
Callahan, Joseph T.	Kirtland/BCE
Carey, Robert L.	McClellan/BCE
Carr, Benny M.	AWC
Catlin, John E., Jr	USAFE/DE
Clark, Zack C.	TAC/DEP
Clements, Douglas M.	USAF/PREEC
Cocke, William F.	AFCOMS/ER
Cole, Earle R.	Beale/BCE
Colvin, Thomas E.	823 RH/Eglin
Conover, Charles B.	Bergstrom/BCE
Cooper, Kenneth M.	ATC /DE-2
Cornell, David M.	Osan/BCE
Correll, Charles A.	MAC/DE-2
Cunningham, John T., III	AFSC/DE-2
Cusick, Paul B.	Loring/BCE
**Decicco, Ignatius	AF/NGB
Deluca, Jerry J.	AFRCE/WR
Dixon, Robert E.	Barksdale/BCE
Dominguez, Luis F.	USAF/PREV
Dupree, Forist G.	Charleston/BCE
Edwards, David J.	SAC/DEE
Ellis, George E.	USAF/PREM
Fears, Walter H.	Lowry/BCE
Ferree, David F.	Bolling/BCE
*Fike, Tommy J.	TAC/DEH
Fluhr, Wallace E.	USAFA/Faculty
Foster, Herbert R.	MAC/DEM
Francis, George F.	ADC/DEE
Frias, Reynaldo	USAF/IG
*Fried, Clarence D.	USAF/PRESP
Fullmer, Wayne M.	ATC/DEP-2
**Gagnon, Raymond C.	AF/NGB/DE
Garren, Roland R.	Eielson/BCE
Geer, Richard P.	5AF/DE
Gennaci, Ignatius J.	AF/SOUTH
Gifford, Robert N.	ADC/DE-2
Gogal, Robert M.	USAF/PRET
Goodwin, Roy M.	Travis/BCE
Gracey, Robert H., Jr	Offutt/BCE
Halac, Harry E.	Langley/BCE
Hale, Jerry W.	Shaw/BCE
Hall, John A	AFCOMS/WR
Hampton, John A.	Elmendorf/BCE
Harding, Robert C.	Altus/BCE
Harlan, Maurice R.	USAFE/DEP
Hartmann, Arthur J.	554RH/Osan
Hawkins, James R.	USAF/PREE
Hedge, Thomas L.	Hickam/BCE
Hicks, James N.	PACAF/DEM
Hinz, Richard H.	PACAF/DE
Hobbs, Terrence E.	SAF/ILI
Hollingsworth, Joe B.	Ellsworth/BCE
Hurst, Gerald B.	USAFSS/DEP
Iten, Robert M.	AFCEC/CC
*Jackson, Donal P.	USAF/PRES
**Jewhurst, John H., Jr.	USAF/PREP
Kent, Richard B.	Clark/BCE
Key, Sydney E.	AFRCE/CR
Kinder, Morris B.	USAFA/DE
Klingensmith, Robert L.	PACAF/DE-2
Knutson, Duane E.	Malmstrom/BCE
Korzep, David A.	Ramstein/BCE
Krueger, Earl L.	Rickenbacker/BCE
Lemons, Roy D.	USAFSS/DE
Liddicoet, William B.	ASD/DE
Lustig, Sheldon J.	SAC/DE-2
Lytle, Lowell C.	McChord/BCE
MacKenzie, James S., Jr	USAFE/DEM
Macoubray, James G., III	McGuire/BCE
Magazu, Harry H.	SAC/DEM
Maines, Leland	AFCOMS/DEP
Martin, William C.	SAMSO/DE
Martino, Salvatore F.	Vandenberg/BCE
McFarlane, Raymond E.	Sheppard/BCE
McGovern, Larry E.	Nellis/BCE
Morton, Alan W.	AFSC/DEP
*Mund, Harold H.	Elmendorf
Munsie, Lawrence, Jr	COMUS/Japan
Murray, Edmond F.	Keesler/BCE
Mussetto, Elo	ATC/DE
Olesen, Leo E.	SAC/DEH
Paul, Herbert D.	ATC/DEH
Pearman, John D.	Lackland/BCE
*Perry, John	USAF/PRESP
Plack, Richard P.	1185 CE GP/CC
Poad, William J.	TAC/DE-2
Poirier, John T.	ADC/DEP
Pope, Dallas H.	Yokota/BCE
Porter, Leroy C., Jr	Hill/BCE
Potter, Frederick R.	USAFE/DER
Rains, William E.	TAC/DE
Reaves, Donald R.	Kelly/BCE
Reding, John J.	Rhein Main/BCE
Reining, Robert R.	Andrews/BCE
Reynolds, Pleasant G., Jr	Tinker/BCE
Robb, William G.	WPAFB/BCE
Roesener, Arlie K.	8th AF/DE
Roth, Charles A.	Edwards/BCE
Rubenstein, Morris B.	ADC/DE
Rutland, George L., Jr	Chanute/BCE
Sachs, Sumner S.	ESD/DE
Salem, Leroy J.	AFCOMS/CR
Scheideman, Elton D.	Minot/BCE
Scrafford, Richard E.	Dover/BCE
Sexton, John N.	PACAF/DEP
Shaw, William M., Jr	AFLC/DEM
Sheehan, Leo F., Jr	Plattsburg/BCE
Shuler, Ellie G., Jr.	SAC/DEP
Sims, William R.	USAF/PREVX
Smith, Thomas W.	Fairchild/BCE
Snider, Henry G.	AFSC/DEE
Stebick, James A.	IG/Gnd Safety
Strait, Ernest D.	USAF/PREP
Strom, Oren G.	AFIT/DE, Dean
Tate, George R.	Griffiss/BCE
Taylor, Daniel D.	15th AF/DE
Tefft, Howard E.	USAF/PREMC
Thomas, George J., Jr	MAC/DEP
Thomas, John P.	SARPMA/CC
Tissaw, George H.	USAF/PRER
**Troutman, Ray K.	AFRES/DE
Tuttle, George G.	Andersen/BCE
*Vale, Lewis G.	AFSO
Waldron, David L.	AAC/DE
Watkins, Church, Jr	ADC/DEM
*Watson, Marion	AFCOMS/Europe
Weaver, Thomas G.	Randolph/BCE
Willett, James G.	SAC/CEV
Woods, Donald R.	AFCS/DE
Yamada, Hisao	USAF/PREPA
Yancey, Kenneth E.	OSD/I&L
*Yee, Edmund C.	PACAF/DEH
Yow, Bobby G.	Carswell/BCE
RETIREMENTS	
Auld, Harry E.	Deneke, William L.
Blanton, Eugene T.	Doderer, Earl S.
Brame, Horace L.	Pearson, Morris W.
Buzbee, Jack A.	Richardson, Dewey E.
Coffee, Kenneth H.	Ruiz, Carlos M.
Corrao, Nicholas A.	

*Services
**Reserve or Guard



by Lt Col Marvin T. Howell, PE

Does becoming a registered engineer/architect enhance an officer's promotion potential? Is your PME emphasis program working? How are we doing on the new OER? An appraisal of these pertinent personnel management areas are reviewed by PALACE BLUEPRINT.

Professional Engineer Registration

PALACE BLUEPRINT encourages officers to become registered Professional Engineers (PEs) or Registered Architects (RAs). It is a normal part of an engineer's or architect's professional development and is a goal all should strive to achieve. To receive a PE license, an officer's education and experience are reviewed and validated as sufficient for him to practice his particular discipline in a particular state. Most officers who become registered feel a strong, personal pride and contribute to the maintenance and strength of the profession.

What does registration mean to a military engineer as far as increasing his promotion potential? In short, the answer is probably very little. Promotion boards consider the "whole person" concept and promote the best qualified. The boards look at an officer's education (academic and professional military), breadth of experience, performance (OERs), leadership, combat/achievements, level/degree of responsibility, and professional status. Of course,. registration does indicate professional status, and therefore, could be a factor in how an officer is scored by a promotion board member. However, promotion boards consist of officers from numerous career fields who may or may not know the meaning or significance of registration. There are only two ways registration can be brought to their attention:

- **Include the fact that the officer is registered in his OER, and**
- **If an officer was registered prior to 5 April 1974, it was annotated on his AF Form 11.**

Once registered, an officer should contact his local CBPO to have Special Experience Identifier (SEI) 315 entered into his records. This SEI then appears on his career brief which is one of the tools used in making his assignments. In only a few Air Force positions is it actually mandatory to possess a PE or RA license; however, it is good in-

formation to have when matching people against requirements. As mentioned previously, SEIs are not included on a selection brief used by a promotion board.

If an officer is pursuing professional registration to help himself to get promoted, yet has neither a graduate degree nor completed his professional military education (PME), he has his priorities reversed. Both graduate work and PME are quite important in the "whole person" concept and can be significant in determining the promotion potential of an officer. If you want to be further recognized by your peers as a professional and want to gain confidence in your ability to tackle the toughest engineering or architectural jobs, then you should pursue registration as a professional engineer or a registered architect. You should pursue registration with this perspective in mind, and you should never overlook your PME and graduate degrees.

Increasing the number of registered engineers and architects in Air Force Civil Engineering does foster professional recognition and the image of the career field. It can also establish more professional negotiation power in dealing with civilian architectural/engineering firms. In summary, registration is worthwhile and should be a milestone in an officer's professional development program. Professional registration may influence job possibilities in a few cases, but its main value is personal development, peer recognition and pride of achievement. **Figure 1** reveals the number and percent of officers, by grade, who are professional engineers or architects in Air Force Civil Engineering.

Professional Military Education (PME)

Great strides are being accomplished by Engineering and Services officers in this area, **Figure 2.** Let's not stop now; let's keep pushing. The goals for career Engineer and Services officers should be the completion of:

- **Squadron Officers School prior to the fourth year and consideration for promotion to captain and regular augmentation;**
- **Intermediate Service School (Air Command and Staff College by correspondence or seminar) prior to the 11th year and consideration for promotion to major;**
- **Senior Service School by correspondence or seminar prior to the 16th year and consideration for promotion to lieutenant colonel.**

Each officer should remember that completion of PME by another method does not keep him from attending in residence. In fact, since it is a part of the "whole person" concept, it may help him get the opportunity to be nominated for attendance in residence.

Figure 1: Registration: Architects and Engineers.

Grade	Number	Percentage of Total In Career Field
Colonel	37	33.3
Lt Colonel	84	30.2
Major	77	22.8
Captain	72	9.9
1st Lieutenant	3	1.2
2nd Lieutenant	0	0.0

	Senior Service School			
	Nov 76		May 77	
	E*	S**	E*	S**
Majors	18%	9.5%	24%	24%
Lt Colonels	36%	30.0%	50%	37%
	Intermediate Service School			
	Nov 76		May 77	
	E	S	E	S
Captains	10%	12%	14%	17%
Majors	33%	20%	56%	47%
	Squadron Officers School			
	Nov 76		May 77	
	E	S	E	S
2nd Lieutenants	3%	7%	2%	0%
1st Lieutenants	14%	22%	15%	15%
Captains	67%	61%	75%	70%

*Civil Engineering Officers. **Services Officers.

Figure 2: PME Barometers—Percent Completed.

New Officer Effectiveness Report (OER)

Although it may be too early to tell, indications to date show that Engineer and Services officers are competing well. This isn't surprising, considering the talent within Engineering and Services. Officers in the career field are presented with challenges to manage vast resources, to increase productivity, to improve the quality of life in the Air Force community, and to enhance the Air Force readiness capability.

With a controlled rating system where only 50 percent of a review group can receive the top two ratings, many officers are going to receive a "3" rating. Is the "3" OER competitive? Again, results so far reveal that it has been competitive in that officers with "3s" **have been promoted to each rank.** Obviously, it is more competitive when the officer is considered for captain (promotional opportunity 95 percent) than it is for lieutenant

(cont'd on page 36)

COLONEL HOWELL *recently joined the Air Force Engineering and Services Agency at Kelly AFB, Texas. Previously, he was a Career Management Staff Officer and the PALACE BLUEPRINT Team Chief at the Air Force Military Personnel Center, Randolph AFB, Texas. A registered Professional Engineer in Alabama, he earned his bachelor's degree in mechanical engineering from Mississippi State University and his master's degree in industrial engineering from the University of Pittsburgh.*

CESMET:

Editor's Note: The August 1975 issue of the **Quarterly** *published an article entitled "CESMET—In Support of the Mission and People." Col G. E. "Jud" Ellis, the first Team Chief, introduced the concept of the Civil Engineering and Services Management Evaluation Team in the article and explained various aspects of its operations. Now, Colonel Ellis makes some further observations on the CESMET on the occasion of his departure for a new assignment. Concerning his following remarks, he says, "No universal solutions are offered. There are few mechanical or simplistic answers to the complex business called base level management. However, if one comment offers the reader a clue to solving a problem or an innovative approach to an opportunity, this article will have served its purpose."*

With some confidence, I can report that at least two parts of our Engineering and Services business have not changed. The job is still tough and getting tougher. The CESMET concept and its conduct of operations are still intact. We continue to look at the "product"—management results, not procedural compliance—and those things that make money and life better for our people. On the other hand, one important change is clearly evident. **Base level management is better—much better!**

Consider the following. CESMET has been "in the trenches" during 65 visits to major bases worldwide—the Pacific, Europe, Alaska and the CONUS. It has replaced our staff assistance visits as the focus on base level management evaluation. In this capacity, CESMET often challenges management values and suggests changes to our systems and processes, many of which are currently being tested for worldwide application. CESMET's experiences and observations have been encapsulated in a brochure entitled **PULSE POINTS FOR MANAGERS.** It offers 61 important guideposts for those involved in base level management. Much has already been done, but there is yet more to do!

My previous article addressed, among other things, the importance of adequate transportation, supply, procurement and budget support to a Civil Engineering operation. Equally as important to overall base management is the Civil Engineer's support of these same organizations. CESMET is convinced that there is no such thing as one good organization on a base. **Many have to be good for one to be good!**

A transportation squadron cannot hope to keep the base vehicle fleet moving without concerned user involvement. The Civil Engineer typically has the largest share of a base's vehicle assets, both general purpose and special purpose. It logically follows then that the Civil Engineer's operator maintenance and care program has a significant affect on how well the transportation squadron can perform its mission. Since our force productivity is contingent on the availability of vehicles—both work platforms and "people movers," we do ourselves and the transportation people a big favor when we have an effective vehicle care program.

A chief of supply cannot do his job well without knowledgeable customers. The Civil Engineer is a tough customer to support. Many of our supply requirements are much more difficult to "describe" than repetitive weapon system parts. It follows then, without knowledgeable civil engineering customers "tuned in" to the complexities of the supply system, responsive support is next to impossible. **This is not an arena for amateurs—both organizations must know what they are doing.** It is supply's responsibility to provide the necessary systems training, but it behooves the Civil Engineer to verify the quality and substance of the training. Without much doubt, the interface between supply and civil engineering is the most complicated on the base and, at the same time, one of the most important.

"Procurability Reviews," a continuous dialogue between the civil engineering design staff and the procurement contract buyers, is essential for each organization to do its job effectively. **Engineers can and should plan and execute their design ef-**

An Update

by Col G. E. "Jud" Ellis

. . . a management tool that can make a positive impact

fort throughout the entire year, even for those projects that do not have identified funding. The engineer can then place these projects "on-the-shelf" to await funds which often arrive in "bunches" near the end of the fiscal year. "On-the-shelf" projects historically attract year end funds. Obviously, a healthy interface would find procurement an integral part of the design process. It makes little sense for the Civil Engineer to "hide" his projects on-the-shelf only to discover too late that procurement is unable to "buy" them when funds become available. Changes are obviously much easier to execute during the design process in a relatively routine work environment than in the crisis environment typical of year end operations.

A big part of resource management in our business is funds visibility, both point data and trend analysis. It is important that we know where the dollars are and where they are going as the result of our decisions. Since the Civil Engineer typically manages from 40 to 60 percent of a base's financial resources, resource management is a large pole in his management tent. Although the Civil Engineer has the responsibility for his own resource management, the budget folks have the expertise and a big part of the responsibility for resource management training. We must use this available expertise to be sure that our funds manager is "up to speed." In this regard, it is well worth a civil engineering organization's time to schedule a briefing by the resource management team. The funds manager should be a member of the resource management team. Exposure to other resource advisors and their management techniques and problems adds to his or her experience bank and will make the management of dollar resources even better. Not only must we work with the budget office on an almost daily basis, but we must also work with other resource advisors.

Again, permit me to emphasize that there is no such thing as one good organization on a base; for one to be good, many must be good. Implicit in this assertion is the fact that functional interfaces must be healthy.

A final observation. When members of the Headquarters US Air Force CESMET visit a base, they bring with them a management mosaic that they have fashioned from good operations observed during 65 base visits. This mosaic plays a big part during discussions with the base as we suggest alternative ways to do the job better with the management tools already available. More often than not, the base manager directly involved agrees with CESMET's recommendations. We view this agreement as a personal commitment to make changes to ongoing operations—a less than subtle unwritten contract. This contract is sufficient motivation to get on with solving identified problems—an appropriate substitute for periodic responses to formal evaluation reports. Obviously, **the best solution to a problem is useless unless a manager is motivated to action.** Therefore, CESMET focuses on motivation, an important catalyst for innovation and controlled change.

Why CESMET? It's only a management tool. Approached properly, it can make a positive impact. But, it is just a tool—one of many that we must use to enhance productivity. The bottom line should read: When a base benefits from a CESMET visit, so does the entire Air Force. . .and you can "Take That To The Bank!" E&S

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COUNTERPOINT

MBO: Asset!

by Col Sheldon J. Lustig, AIP

Major Manekofsky has made the "Point" that we have been too quick to endorse and adopt the Management by Objectives (MBO) system in the military and, in particular, that we have seriously erred by making it mandatory. He purports to subject the concept to critical analysis and asserts that some of its recognized weaknesses are sufficient reason to change the AF/PRE policy requiring mandatory implementation. My purpose is simply to "Counter" his "Point" where it falls short of the mark.

First, Major Manekofsky is to be commended for his effort, especially for highlighting some of the pitfalls to successful MBO implementation. Unfortunately, he probably should have enumerated all 20 potential pitfalls and, in addition, the political constraints articulated by George S. Odiorne in his June 1974 article in **Buiness Horizons**, "The Politics of Implementing MBO." No one, not even the most fervent MBO advocates, has claimed that instituting an MBO system is easy and guaranteed to produce results. There is no doubt that Major Manekofsky has been **critical** of the military application of the concept, but I find his analysis somewhat deficient. Admittedly, there have been very few studies to evaluate the specific impact of an MBO system on organizational and managerial effectiveness, either in the private or public sectors. Consequently, my "Counterpoint" of necessity will focus on the logic and sufficiency of his arguments.

Two specific reasons are cited to support the claim that MBO may not be applicable to the non-business world: **Key result areas are more difficult to define and management styles are often not compatible with MBO.** There is no doubt that market share and return on investment are not applicable to military institutions. Nevertheless, objectives related to improving dining hall and billeting facilities and services are measurable according to pre-established, end-state criteria and timelines. There are, in fact, innumerable other examples in every major air command today. Remodeling a Production Control Center, raising the Military Family Housing Occupancy rate, establishing a U-Fix-It Store, winning the Air Force Thomas D. White Environmental Protection Award, increasing the holding area supply inventory turnover rate for work orders and job orders, improving customer satisfaction (AF Form 1255 Program), and bedding down a mission change are typical key result areas that can be translated into measurable objectives geared to specific target dates and articulated in practical implementation plans. There is no end to the number of potential key result areas open to Base Civil Engineers and Chiefs of Services. In fact, **one key to establishing an effective MBO system is to carefully select a manageable number of objectives.** After all, too many may dilute and the wrong ones can misdirect organizational energy. For those who may counter with the observation that results can be produced without a formal MBO system, there is an added intangible benefit—analagous to Babe Ruth's home run when he pointed to the fence and then hit the ball out of the park. Few can deny the special thrill of that moment and the personal satisfaction it must have produced.

Citing the need for a democratic management style as a pre-condition for MBO success is misleading and misrepresents Professor McConkey's point; in fact, he does not employ the term "democratic" leadership style. Instead, he maintains that a "balanced, participative style, one which encourages maximum participation while discouraging permissiveness" is more likely to succeed. The attributes used by Professor McConkey to define this style are both pertinent and revealing, certainly not incompatible with management in a military institution with hierarchical rank structure:

- **"In depth delegation.**
- **Maximum participation in the objective setting and planning processes.**
- **Managers permitted to make some mistakes.**
- **Change encouraged and planned for.**
- **Policies and procedures minimal and subject to change when necessary.**
- **Controls tight but only the minimum imposed to keep the unit in control.**
- **A meaningful reward system.**

(cont'd on page 22)

POINT

MBO: Military Asset or Liability?

by Maj Harvey Manekofsky

Since the Management by Objectives (MBO) concept is enjoying increasing popularity within the military, it is time to subject this concept to critical analysis. Presently, MBO literature is over weighted toward positive aspects of the concept. This analysis hopes to point out certain weaknesses and limitations of the concept to increase MBO understanding. Questions this article hopes to answer are: Is MBO such a fashionable management catch phrase that it is now a management liability? Is this methodology stifling creative management thinking in the military? Are military managers studying MBO to see they need the approach or are they indorsing it to satisfy superiors? Has MBO become mandatory and is it being sold as a "cure all" or surefire technique to improve management success?

I believe there are crucial weaknesses to MBO when applied to the military that are being overlooked. This article will endeavor to examine these weaknesses which can become potential pitfalls to successful application of MBO at base level. First MBO will be defined and its origins investigated. Then MBO problems and disadvantages will be discussed. Finally a new direction for military managers will be recommended.

The first step toward settling the confusion surrounding MBO is to define this frequently misused term. While some commanders mistakenly use the phrase "Management by Objectives" as a synonym for "solve this problem" or "emphasize this area," others equate MBO to a club technique for holding subordinates accountable for reaching milestones in timely fashion. Such commanders are using a KIA (Kick in the Ass) approach but are calling it MBO. Here, MBO means a systematized, results oriented management approach. It refers to a definite focus management procedure involving a contractural arrangement between the boss and his subordinates. MBO means a management philosophy whose success depends upon organization acceptance and identification of proper key result areas. Joseph Massie once stated that, "that which is measured is that which receives attention" and this is the fundamental precept upon which MBO builds.

This definition and the business world origin of MBO provide us with the first clues as to why some Base Civil Engineering organizations are having trouble with MBO. **The question of whether or not MBO is transferable to the military or government world is still open to debate.** Peter Drucker, one of the originators of MBO, is primarily associated with the business world. MBO evolved and is ideally suited to the business sector. Key business sector result areas such as market share, return on investment, and turnover of inventories are easily definable and are unquestionably life-blood items of successful companies. Key business result areas are easily measured and the end result goal of profits provide excellent MBO system feedback for reanalysis and readjustments. In contrast, the quality and extent of military security or government service provides poor measurable feedback data. Therefore, the military must apply MBO in a totally different environment. Key result areas are much harder to accurately define in military organizations. Military MBO in-

Articles published in this department provide engineers and services personnel with the means to openly discuss their ideas, controversial or otherwise, on how they can better perform their duties in Engineering and Services. Contributions are welcome and only those that offer constructive commentary will be selected for publication. Articles should be kept to a minimum of 600 words, if possible. Address your comments to the Editor, AFIT/DEJ, Wright-Patterson AFB, Ohio 45433.

Major Manekofsky was the Chief, Base Industrial Engineering, 341 Combat Support Group, Malmstrom AFB, Montana, when he authored the article presented here. He has since rotated and is now assigned to Headquarters Pacific Air Forces in the Far East.

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dorsers seem to be ignoring management expert Rensis Likert's implied warning about management systems that overemphasize the measurable. Likert identifies the nonmeasurable variables to the management equation as intervening variables, and they include such things as morale, skill level and loyalty. Military users of MBO must carefully consider this critical point. Some of the most important management variables to the success of military organizations do not lend themselves to an MBO milestone measurement technique; yet, if these items are not given priority, the MBO manager may end up putting too much emphasis on the wrong variables.

MBO users must also keep in mind, that despite the fact that MBO is ideally suited to the business sector, many civilian firms have had unsuccessful experiences with MBO. Dale D. McConkey, management consultant and professor, has written many articles on MBO failures and has even listed the 20 most common pitfalls of why MBO has failed in business sector organizations which he has studied. These pitfalls run from "considering MBO a panacea" to being "too impatient for results." Military indorsers of MBO de-emphasize the many difficulties of implementing MBO as pointed out by McConkey. All 20 of McConkey's pitfalls apply to the military organization. Furthermore, the military environment creates additional pitfalls to the business sector list that will be discussed later in this article.

A second even more basic MBO origin idea provides another clue to Base Civil Engineering MBO problems. MBO is a concept that attempts to take optimum advantage of achievement needs of man. Man is achievement or need oriented. This needs idea is developed at length in Maslow's work on the hierarchy of needs. Set goals and man will try to reach them. **MBO, however, appears best suited to higher levels of organization, such as MAJCOM or Wing staff level, as opposed to the shop level at a base.** The informal atmosphere and better education of upper management lend themselves better to an MBO philosophy. In Base Civil Engineering, we try to apply MBO to all levels and we try to encompass even the lowest level concerns. This approach complicates identification of key result areas and presents problems where lower level concerns (such as labor union objectives) differ from upper management concerns. For instance, upper management goals such as increasing productivity and reducing costs may conflict with shop worker or union goals of job stability and job security. Military users of the MBO philosophy are warned to take extreme care to insure they consider potential conflicts in individual and organizational goals. Otherwise, MBO can create unnecessary conflict and will soon become a liability.

This MBO origins investigation and the MBO definition discussion suggest that perhaps managers should be more cautious about trying to apply MBO to all Civil Engineering organizations or to all levels of Civil Engineering. MBO background has provided the first of many interesting arguments concerning the MBO approach.

MBO has become a mandatory program for all SAC Civil Engineering base level organizations. Such a mandated program overlooks the possibility that a commander may be a good manager but may be uncomfortable with an MBO philosophy. The particular management style of a boss is critical to MBO success. McConkey concludes that "twenty years of MBO experience have demonstrated that MBO enjoys a better chance for success if its practitioners follow a particular management style." **MBO is most compatible with a democratic leadership style where a partnership-like atmosphere already exists and the contractural relationship vital to MBO success can be easily developed;** however, some base level military commanders do not even have time to use a democratic leadership style. The very nature of many day-to-day base level decisions and the very divergent rank structure at base level inhibit participative or democratic leadership. Drucker himself discusses the time and compensation hierarchical impediments to MBO that exist even in the business world and these impediments are even greater in the military environment. The importance of leadership style, rank structure, and the added meeting time which is required for a participative MBO philosophy must be considered when an MBO program is applied to Base Civil Engineering organizations.

Another aspect of the time problem creating a handicap to military MBO success involves military transience. McConkey points out that the real impact or effectiveness of MBO takes from three to five years. For most military units **this means many turnovers of managers at all levels and each manager may have a different idea of key result areas, a different philosophy, different needs and a different management style.** This transience greatly complicates the equation for MBO success and if not considered will insure that MBO becomes a liability instead of an asset.

Even if MBO is not mandatory for some military organizations, there are other MBO conceptual problems that need more attention. MBO is presently taught at the Civil Engineering School at Wright-Patterson AFB, Ohio as a complete program or management system. School handouts on implementing MBO are filled with charts and diagrams which seem to emphasize the program idea instead of the approach idea. Perhaps this is why so many Base Civil Engineering organizations, including my own, are having so much trouble with their MBO programs. The Base Civil Engineer (BCE) and the Industrial Engineer (IE) are asking themselves if they are running MBO properly. Are charts correct? Did the concerns triangle work? Were concerns properly

converted to objectives with feasible milestones? Such questions may be important to a system but are they really important? **Shouldn't the important question be whether or not one is managing his Civil Engineering organization as best he can?** This is the key question to understanding why it is time to reassess whether or not MBO is an asset or a liability. The focus of MBO seems to be turning toward the program instead of its intent. This is a natural pitfall and is one of the 20 pitfalls McConkey points out existing in the business sector. At a 1974 SAC Industrial Engineering workshop, over 30 percent of the attending IEs who had implemented MBO responded to a questionnaire that they felt nothing had been achieved by their MBO programs. Such results imply that perhaps every unit does not need an MBO program, and by making MBO mandatory, a liability may have inadvertently been created.

Another MBO problem is that this program has become an independent item of interest to management assistance teams and to the Inspector General (IG). Such groups should look at the squadron's management and then critique the squadron's MBO or alternate program on the results it is achieving. Only this approach makes sense. Recently, my own squadron received no write-up from the IG on its MBO program, but the Operations and Maintenance Branch and Programs Branch both received marginal ratings. There should be a cause-effect relationship similar to the relationship between a squadron's training program and hardware maintenance program. It is rare to find a squadron that has an excellent training program yet performs unsatisfactory maintenance. A similar relationship should exist between a squadron's management system and its overall operations.

All of this discussion suggests important new directions for Civil Engineering management programs. First, Air Force Civil Engineering channels must accept management as both art and science in fact as well as in theory. Standardized or popular management ideas should not be expected to have universal application. **MBO should not be expected to work everywhere and should not be an independent item of IG interest.** Individual bases must be allowed to develop their own management programs. Schools should teach management fundamentals, not management programs.

Military managers must recognize the limitations of MBO. Management is too dynamic a topic for military leaders to accept one philosophy as being the single best approach for all units. A recent article in **Business Week** magazine discussing an innovative management technique called "model-netics" concluded that "to some observers, the success of model-netics merely proves that any system works if enough people believe in it strongly." This statement raises two questions relevant to the MBO issue: first, could model-netics have been developed in a military MBO environment? and, second, do base level units really believe in MBO or are they being forced to believe in MBO? The military must be careful to insure that MBO does not force military management into a straight-jacket which will hinder creativity or force units into adopting something they don't truly believe in; otherwise, MBO will be a liability.

Individual bases should be encouraged to develop their own management programs. If a program is devised at base level, the IE and BCE will take more pride and credit in it. Is this not the essence of motivational achievement? Such an approach would take much better advantage of Maslow's need theory than a decreed MBO program. The new direction from Air Force Civil Engineering channels must be: Have a management program to improve unit performance, not necessarily have an MBO program. Hopefully readers will not have second thoughts before rushing to implement MBO. All of the answers are not in this article but, if critical analysis is allowed, there is hope that the answers will be found. All those concerned and responsible for improving Civil Engineering management should take another careful look at MBO. For some managers, MBO may be a very useful approach but for others it will end up being a useless square-filling exercise. It must not be taken for granted that MBO is the only approach good for Civil Engineering. The BCE runs such a complex, diversified operation that a management approach built upon focusing attention on a narrow range of key measurable factors may be too unwieldy or restrictive to be of benefit. Enough time has been spent on overteaching MBO implementation techniques and on preparing nifty charts for evaluators. The BCE with IE help must now spend all his efforts on coming up with his own best management approach, one with which the BCE will be comfortable and one that is suitable to the people under his command.

The real intent of this article has been to reassert the dynamic nature of management ideas. By discussion of MBO pitfalls it is hoped that military managers will reassess whether or not the military was too quick to fully indorse the popular MBO management concept from industry. The danger when applying successful industrial management ideas to the military is that the transfer may be done without enough thought, study or research concerning the distinct peculiarities or idiosyncracies of the military management environment. Everyone must be made aware that a successful base level MBO program is not easy to implement nor may it be needed. Hopefully, this critical analysis of MBO will warn managers of potential MBO problems and **will stimulate creative military management thinking.** If this happens this will be the best hope for MBO becoming a future military asset.

MBO: Asset!

(cont'd from page 18)

• A high degree of self-management, self-discipline, and self-control on the part of managers."

Without belaboring the obvious, one might also observe that along the management style spectrum of autocracy to democracy, there are many opportunities for an MBO results oriented system to work. It is the extremes that are non-supportive of MBO. Before leaving the issue of applicability and the innuendo implicit in the charge that MBO was originated by one who is primarily associated with the private sector, it is sufficient to quote Peter Drucker's most recent **Wall Street Journal** editorial of February 4, 1977:

"But even the most convinced moralist would likely admit that the bulk of governmental efforts today belong in the category of economics, in which results are the proper measurement of an activity and the proper concern of management." Moreover, in his article, "Leadership in the Military," (**Perspectives in Defense Management**, Spring 1973, ICAF), Brig Gen Robert G. Gard, Jr, US Army, sums up very well the applicability of a goal-oriented planning system to an individual and a military organization:

"Unless the individual feels that personal goals are involved in the performance of his duty, he will put forth less than the effort and the skill of what he is capable. The best way to involve him is to consult him whenever practical, in the formulation of goals and objectives, and how best to attain them. Obviously, in a military or any other hierarchical system, the range and degree of consultation are going to be more limited than, say, in a New England town meeting. Participatory management means different things in different organizations, and at different levels within an organization, but we could have more of it in the military than we have now, and the system would be the stronger for it."

The rapid turnover of military managers is cited as another impediment to MBO success in the military. This argument ignores the continuity usually provided by civilian deputies and assumes that the next person to take charge will start from scratch with a completely new set of key result areas. To lend credence to his argument, McConkey is cited again to the effect that the real impact or effectiveness of MBO doesn't occur for three to five years. Placing his words in context, the three to five years refers to the time it usually takes for individual managers in an organization to transition from pre-MBO to post-MBO management styles, summarized by F. D. Barrett in his article, "The MBO Time Trip," published in **The Business Quarterly** (Autumn 1972).

PRE-MBO	POST-MBO
Day-to-day managing	Future-focused
Amateur, seat-of-pants	Full-fledged professional
Inward-looking	Outward-looking
Product-oriented	People-oriented
Organization-oriented	Consumer-oriented
Activities-oriented	Results-oriented
Administration of routine	Creation of Innovations
Emphasis on "how to"	Emphasis on "what to"
Emphasis on money, machines, materials	Emphasis on people, minds, time
Centralized, technocratic, functional control	Decentralized initiative from subordinates
Authoritarian style	Participative style

Even though some of the players may change at a particular Air Force base, the impact of improving the effectiveness of individual Engineering and Services managers remains a **constant**, especially if everyone is encouraged to employ the MBO philosophy and system as a matter of policy.

Probably the most important "point" to "counter" is that by making the MBO system mandatory, motivation and creativity are stifled. Management literature amply suggests that the opposite is far more likely to occur. Barrett's post-MBO transition summary is illustrative. There is no quarrel with the contention that the MBO system should not be made another compliance checklist item for inspectors. On the other hand, it is not inappropriate for the Civil Engineering and Services Management Assistance Team to suggest that such a system be employed, especially when the organization has many significant problems and seems to be drifting aimlessly in the present without some planning system that focuses on the future.

The original AF/PRE policy letter establishing the MBO system as mandatory **does not require a standardized set of specific system mechanics and objectives.** It establishes the key and essential elements of the system and describes an optional set of procedures as guidance. With some exceptions, objectives are to be selected at each base and oriented toward local needs and desires. From time to time, however, base level managers have been urged to either set a particular objective or apply the MBO approach to a specific key result area. Although this may not always be the best way to stimulate creativity, it is often a convenient and effective way to communicate higher level aims requiring intensive and coordinated long-range planning and tracking. It is, therefore, a very broad planning system framework within which MBO is decreed as AF/PRE policy. There are no reports to higher headquarters, no standard procedures and formats to follow, no balance tables upon which major air commands or Air Force bases are compared and ranked, and certainly no end to the possible selection of objectives and the means to achieve them.

WORTH NOTING

Air Force Academy Presents Kamenicky Award to G. M. Opp

Former Cadet G. M. Opp, Jr, receives Kamenicky Award from Brig Gen C. D. Wright, DCS/Engineering & Services, Headquarters Strategic Air Command.

2d Lt Gilbert M. Opp, Jr., of Widefield, Colorado, was named the 1977 winner of the Kamenicky Award as the Outstanding Cadet in the Civil Engineering Major at the US Air Force Academy.

As an undergraduate, Lieutenant Opp was on the Superintendent's List for excellence in both academics and military training for six semesters. He is currently assigned to the 3415th Civil Engineering Group, Lowry AFB, Colorado, while awaiting entry into undergraduate pilot training at Columbus AFB, Mississippi.

The Kamenicky Award is sponsored by the civil engineering officers of the Air Force. It memorializes a civil engineering graduate from the Air Force Academy who died in 1971 in Southeast Asia when his aircraft crashed after being hit by hostile ground fire.

Whiteman AFB Scores Big in SAC Missile Competition

Whiteman AFB, Missouri, emerged the victor in three out of five categories in civil engineering's missile maintenance competition at SAC's Olympic Arena 77 at Offutt AFB, Nebraska, recently. Whitemans' teams copped honors as the "Best Missile Civil Engineering," "Best Environmental Support Team," and "Best Minuteman Electrical Team." Other winners in the "best of the best" six-day competition were Davis-Monthan AFB, Arizona, for "Best Refrigeration Team" and Little Rock AFB, Arkansas, for "Best Titan Electrical Team."

This was Civil Engineering's second year of participation and the first year separate commands represented the three Titan Civil Engineering units. Joining SAC were TAC and MAC, represented by Davis-Monthan AFB and Little Rock AFB, respectively, in this tenth annual SAC contest.

Whiteman AFB also won the coveted Blanchard Trophy for the best missile wing in SAC.

Brig Gen Clifton D. Wright, DCS/Engineering and Services, Headquarters SAC, Offutt AFB, presented the awards to:

- Whiteman AFB: Best Missile Civil Engineering
- Whiteman AFB: Best Environmental Support Team, MSgt Del L. Deboe and TSgt Homer R. Watkins
- Whiteman AFB: Best Minuteman Electrical Team, Mr Dean Cunningham and Sgt Philip R. Reynolds
- Little Rock AFB: Best Titan Electrical Team, Mr Roger G. Forinash and SrA Eddie C. Powers
- Davis-Monthan AFB: Best Refrigeration Team, Mr Robert L. Chase and A1C Dee M. Rowe

Lieutenant Presented Meritorious Achievement, Officer of Year Awards

1st Lt Trevor L. Neve, left, and his Commander, Maj David Oakes, hold plaques the lieutenant received for the Air Force' Civil Engineering Meritorious Achievement Award, and for being named the Tactical Air Command's Civil Engineering Officer of the Year for 1976. The men are assigned to the 79th Aircraft Control and Warning Squadron, Cape Romanzof AFS, Alaska.

The Facilities Management Program provides graduate education for the officer and equivalently graded civilian to manage civil engineering manpower and funds to accomplish the civil engineering mission. Since 1973, when the Program was initiated, 86 personnel have graduated. Here's an update on

AFIT's FACILITIES MANAGEMENT PROGRAM

by Lt Col Ronald E. Knipfer, PE, and
Lt Col Patrick J. Sweeney, PE

Since the Facilities Management Program was established by the Air Force Institute of Technology (AFIT) in 1973, 76 officers have graduated with master of science degrees. Next month, an additional 10 will complete the program, bringing the total number of graduates to 86. There are 20 quotas each year for civil engineering officers.

The Facilities Management Program was developed by the AFIT School of Systems and Logistics to provide graduate education which would best prepare officers or equivalent grade civilians for management positions in civil engineering. Currently, there are 191 positions in the Air Force which have been specifically identified for facilities management graduates. These highly responsible jobs are at all levels in every major command.

Figure 1: Graduate Facilities Management Program.

COURSES

Quarter I
- Quantitative Methods
- Computer Programming
- Accounting
- Research Writing

Quarter II
- Computer Programming
- Quant. Dec. Making I
- Statistics I
- Financial Mgt
- Org. & Mgt.: Structure
- *Contracting for CEs

Quarter III
- Computer Programming
- Quant. Dec. Making II
- Statistics II
- Research
- Org. & Mgt: Behavior

Quarter IV
- Maintenance Mgt
- Distribution MGT
- Microeconomic Analysis
- Elective
- Elective

Quarter V
- Thesis
- *Econ Analysis for CEs
- Contemporary Mgt Issues
- *Environmental Planning

*Courses specific to the Facilities Management Degree

Facilities management students progress through the one year degree program with students in the Graduate Logistics Management and Procurement Management Programs, taking commonly needed courses. However, each program has specific functional course requirements; the courses designed for facilities management students are identified in **Figure 1**.

The first of five academic quarters consists of accounting, research writing, a review of mathematics, and an introductory course in computer programming. A short five weeks, the first quarter "softens" the return to the classroom and prepares students for the following four graduate level quarters. As the student proceeds through the program, he or she gains the skills necessary to write a well researched and informative thesis on a civil engineering or other Air Force or DOD problem. The thesis is the culmination of the intense and concentrated academic program.

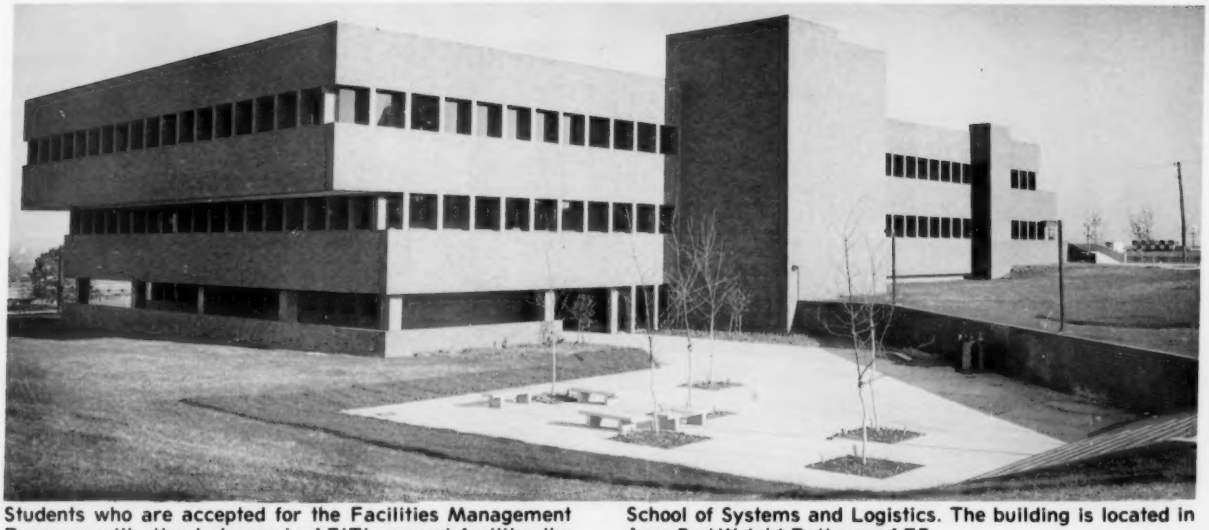
Experience has shown that civil engineers do exceptionally well in the quantitatively oriented curriculum, and with each graduating class many finish in the distinguished graduate category as determined by grade point average.

The driving force behind any academic program is, of course, the faculty—and the Graduate Education Division of the AFIT School of Systems and Logistics is fortunate to have an extremely well qualified group of officers and civilians who possess an optimum mix of academic qualifications and relevant job experience. Of the 22 officers and four civilians on the faculty, over 95 percent have doctorates or are completing doctoral programs. The experience factor assures that courses are presented in an Air Force framework, eliminating the need for translation from the industry-related curricula found in other schools. Enhancement of the program material is achieved by the interaction of the students and faculty in the context of Air Force civil engineering experience.

Requirements for admission of officers to the Facilities Management Program include:

- Three years working experience in civil engineering.
- Undergraduate grade point average of 2.50 on a 4.00 scale from an accredited institution.
- An acceptable score on the Graduate Records Examination (GRE) or the Graduate Management Aptitude Test (GMAT).

Civilian civil engineering personnel are also eligible to attend the program; however, entrance requirements and application procedures are



Students who are accepted for the Facilities Management Program will attend classes in AFIT's newest facility, the School of Systems and Logistics. The building is located in Area B at Wright-Patterson AFB.

somewhat different. The following are the minimum prerequisites for admission:

- Possess a baccalaureate degree in engineering. Civilians who have other degrees from an accredited institution and who have had extensive civil engineering experience may also be considered.
- Complete either the GRE or the GMAT. Test scores must be received before candidates can be declared fully qualified. Applicants who have already completed either of these tests should furnish a copy of the test results along with the nomination format.

The civilian applicant's first step is to submit a request for academic eligibility determination to the AFIT Director of Admissions, AFIT/RRE, Wright-Patterson AFB, Ohio 45433. Two official copies of all college transcripts, one copy of the GRE or GMAT test results, and a resume of the employee's work experience should accompany the request.

The civilian candidate who has received a letter of eligiblity must then be nominated by both the base civil engineer and the base/wing commander. While the grade level of nominees is important, it is not the determining factor in making selections for attendance at the school. Nominees must meet all entrance requirements and have high potential for success in completing the program. Although this would normally result in selection of eligible GS-11s and above, nominations of well qualified GS-9s will be given careful consideration. If more than one candidate is nominated, the base/wing commander will indicate an order or precedence.

This nomination is then forwarded to the major command for approval by the personnel and civil engineering staffs. At the major command, the nominations are placed in priority order and sent to OCPO/DPC, Randolph AFB, Texas 78148, for final selection. Candidates will be informed that, if selected, they must agree to remain with the Department of the Air Force for a minimum of three years after completion of the program.

For further details, consult one of the following sources: Your base education officer; **AFM 50-5**; the AFIT Admissions Directorate, AUTOVON 785-6231; or School of Systems and Logistics, AUTOVON 785-4240/4407. E&S

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Amortization is determined by developing an economic analysis that shows a project proposal will pay for itself in three years. Since it is the economic analysis that gives civil engineers some difficulty, here is a detailed discussion which can help the programmer better understand . . .

THE WORLD OF P341 AMORITIZATION

by Capt John Q. Hill, Jr, PE

If you have ever had the honor of preparing P341 programming documents for urgent minor construction projects, you already know the task is a formidable one. You may have even asked the question, "Why me Lord?" When a programmer faces a construction requirement whose funded cost ranges from between $75,000 to $400,000, he has the option of the Military Construction Program (MCP) or P341 funding. If you choose P341 funding, you must justify your project either on urgency or amortization. Amortization is determined by developing an economic analysis that shows a project proposal will pay for itself in three years following construction. Since it is this economic analysis that gives civil engineers the most difficulty, this discussion will deal with amortization in more detail.

Basically, the desire is to make the amortization process live for you. A panoramic view of the amortization process from savings generation to project completion will help answer the questions of how and why a project can achieve project approval because it amortizes. It must make sense to you. In the framework of an amortization model shown in **Figure 1**, a step by step discussion will explain the concept that generates savings, present value calculations and project cost estimating. As an added item, emphasis will be given to cost increases during design and construction, and required actions following construction.

The Concept That Generates Savings

The heart of the amortization process is what this author terms "differential cost savings." This savings concept is based upon investment, maintenance and operating cost comparisons between an existing facility configuration and a proposed facility. If anticipated expenses for any of the cost functions associated with the new, proposed facility will be lower than the existing mode of operation by a significant amount, the proposed project investment cost may be offset by aggregating all these differential savings. Looking at this savings concept mathematically, it would be expressed by the following: (Total Current Cost Per Year) minus (Total Proposed Costs Per Year) equals Differential Cost Savings.

In Steps I and II of the figure, some of the operating parameters are listed that could lead to differential cost savings. In Step I, some suggested cost areas that should be considered are shown. You may have others and more. Defining what costs to consider is a sensitive and essential step in an analysis. This portion of the model will be quite valuable. Can you see why? Your mind is a versatile computer but it has difficulty in comparing many facts—costs in this case—at one time. A model similar to Step I helps the mind remember relevant costs for comparison so cost savings can be realized. Let's say more about defining costs in your economic analysis.

Defining what operational costs to consider is similar to establishing a system size for a system's analysis. The systems analyst usually selects variables or parameters from a proposed system environment. He includes only those variables that affect system performance in some way. All other variables can remain in the surrounding environment and should be regarded as not being significant. The same holds true for cost variables involved in your economic analysis.

If a cost parameter is not sensitive and thus does not change with respect to a proposed project alternative, then delete it from your economic analysis.

Your mind is now crying for a decent example. Your aircraft maintenance facility requires that parts must be hauled from a supply warehouse on base. If the transportation cost associated with this maintenance facility does not change with respect to any location of a new facility siting of your project proposal, then this cost will not be a source of differential cost savings. You should try another cost function and see if your proposed facility will alter that cost; if it does, consider it for possible savings.

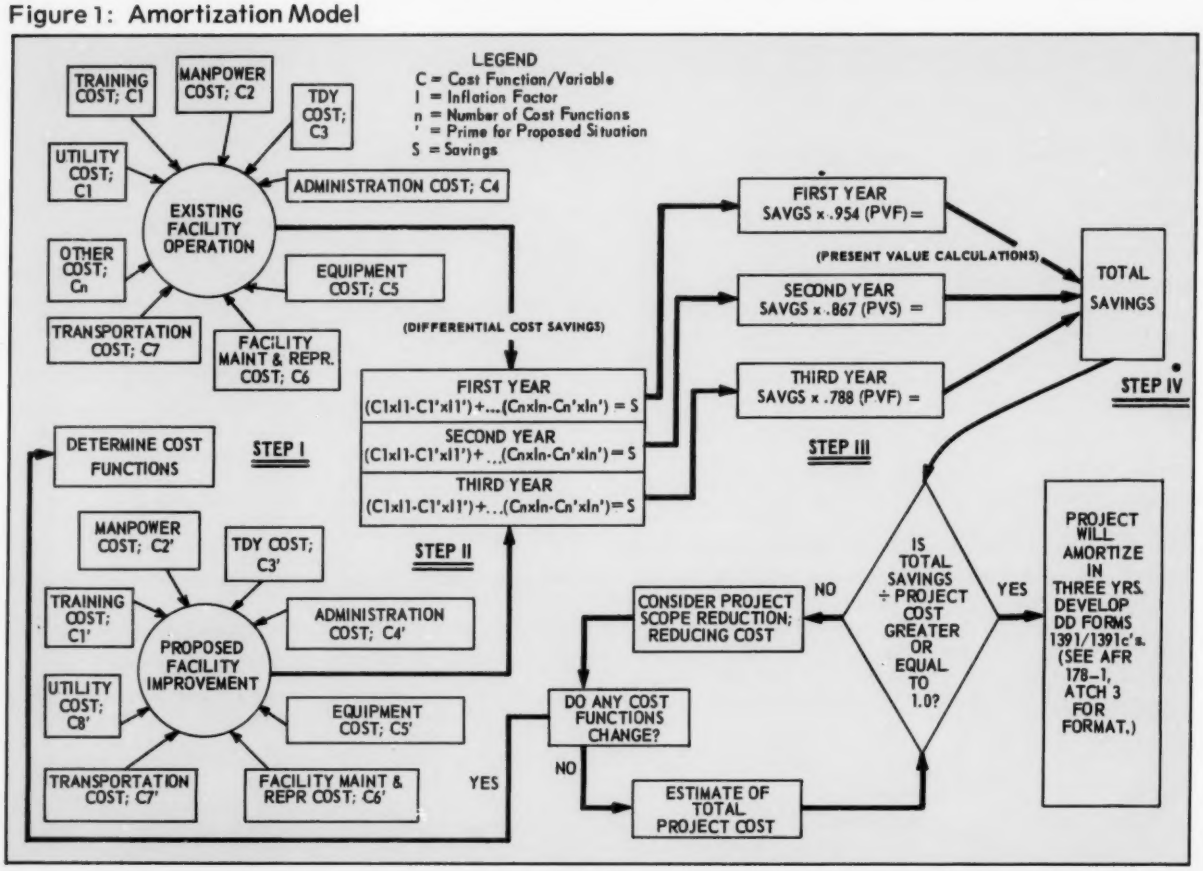
As shown in Step II, inflation factors must be included before differential cost savings can be calculated. In principle, a given cost per year for a function, times the inflation rate for that year, is computed for the existing facility operation. Subtracted from this computed value is the cost per year of the corresponding cost function, times the inflation rate for the same year for the proposed facility operation. You may question the use of different inflation rates for the same time period and for the same cost function. In visual cases, your proposed construction may be out of the geographical area of the existing facility operation, thus making inflation rates different. Going further, utility costs may experience a faster inflation rate in one state compared to another. With everything being equal, you can obtain cost savings just on the inflation rate being lower at the proposed alternative. **AFR 86-1** (Programming Civil Engineer Resources) will ask you to substantiate inflation rates used in your analysis. However, there is no reason why you cannot do this from previous cost records.

After subtracting costs of proposed facility alternatives from existing facility operations, savings can be generated if the differential value is positive. This process is continued for the first year for each cost function. These individual differential savings are then summed for the second and third years in the same fashion.

Before leaving the subject of differential cost savings, a quick summary of main points to remember is essential, and they are:

- **A proposed facility operation that will eliminate a cost function can generate savings.**
- **Cost functions of a proposed facility may have a lower cost rate as compared to the current operating situation, thus yielding savings.**
- **A cost function of the proposed facility may**

Figure 1: Amortization Model


LEGEND
C = Cost Function/Variable
I = Inflation Factor
n = Number of Cost Functions
' = Prime for Proposed Situation
S = Savings
TRAINING COST; C1
MANPOWER COST; C2
TDY COST; C3
UTILITY COST; C1
ADMINISTRATION COST; C4
EXISTING FACILITY OPERATION
OTHER COST; Cn
EQUIPMENT COST; C5
TRANSPORTATION COST; C7
FACILITY MAINT & REPR. COST; C6
(DIFFERENTIAL COST SAVINGS)
FIRST YEAR (C1xI1-C1'xI1')+...(CnxIn-Cn'xIn') = S
SECOND YEAR (C1xI1-C1'xI1')+...(CnxIn-Cn'xIn') = S
THIRD YEAR (C1xI1-C1'xI1')+...(CnxIn-Cn'xIn') = S
STEP I
STEP II
STEP III
STEP IV
DETERMINE COST FUNCTIONS
MANPOWER COST; C2'
TDY COST; C3'
TRAINING COST; C1'
ADMINISTRATION COST; C4'
PROPOSED FACILITY IMPROVEMENT
UTILITY COST; C8'
EQUIPMENT COST; C5'
TRANSPORTATION COST; C7'
FACILITY MAINT & REPR COST; C6'
FIRST YEAR SAVGS x .954 (PVF) =
(PRESENT VALUE CALCULATIONS)
SECOND YEAR SAVGS x .867 (PVS) =
THIRD YEAR SAVGS x .788 (PVF) =
TOTAL SAVINGS
IS TOTAL SAVINGS ÷ PROJECT COST GREATER OR EQUAL TO 1.0?
NO
YES
CONSIDER PROJECT SCOPE REDUCTION; REDUCING COST
DO ANY COST FUNCTIONS CHANGE?
YES
NO
ESTIMATE OF TOTAL PROJECT COST
PROJECT WILL AMORTIZE IN THREE YRS. DEVELOP DD FORMS 1391/1391c's. (SEE AFR 178-1, ATCH 3 FOR FORMAT.)

require less quantities of a given resource which provides savings.

• A proposed facility may have lower inflation rates, thus bringing about savings.

Present Value Method

After savings are generated, they must now be tempered with the time value of money. As indicated in Step III of the figure, present value calculations are required to compare future year savings back to a common reference in time. Since the present value calculations are confusing to some, there is a need to discuss the concept further.

If the investment value of money stayed the same over a period of time, then present value calculations would not be required. For example, if a $300,000 project would generate yearly differential savings of $100,000 for the first three years, then the project would exactly amortize project investment in three years. However, we know the $100,000 in savings will be worth less due to the loss of investment opportunities according to the commercial rate of return on investment. It must be pointed out that present value computations are entirely independent of inflation cost.

The present value concept can best be explained by using an example. Let's say that we both have $100 each at time zero. You take yours and deposit it into a savings account that pays 10 percent interest per year. At the end of the first year, your $100 will grow in value to $110. However, I took my $100 and deposited it into a checking account that pays no interest. Effectively, as I relate to economic opportunity, my $100, by staying the same, decreased in value from $110 to $100. My $100 decreased by a factor of (100/110) 0.909. Basically, this is how tables which show present value factors for the 10 percent interest rate are developed. Although this investment interest rate varies according to the geographic area, **AFR 178-1** (Economic Analysis and Program Evaluation for Resource Management) requires you to use 10 percent for standardization. However, **AFR 178-1** shows the present value factor for the end of the first year to be 0.954 which is different from the factor of 0.909 found in our example and in textbooks having present value tables. What is the reason for this difference? These higher factors allowed by **AFR 178-1** are predicated upon the assumption that cash flows are uniform during the year. The factors are mid-point values and, for the end of the first year, can be computed by simply adding 1.0 to 0.909 and dividing by two, which equals 0.9545. This factor closely approximates the value found in Table A of **AFR 178-1**. Other present value factors for later years are generated in like manner. These factors appear in Step III of the figure and will not change for your amortization calculations. Next, go to Step IV and sum all your savings. Then carry this total savings sum to the decision diamond and enter total into the numerator of the amortization ratio (savings/project cost).

Project Estimating

As shown in Step V, project cost has to be estimated before the amortization ratio can be evaluated. How you estimate your project can have a profound impact upon this ratio. All costs associated with your project undertaking—funded and unfunded costs—must be the investment cost to be amortized. Your construction costs must be realistic and must include projected inflation costs to be experienced at the time of project bidding. If your estimate is low and bids are high, and your amortization ratio becomes less than one, your project may have funding problems. A P341 project is like most facility projects; Gresham's Law applies. Giving the project half a chance, it will grow in scope and cost. A programmer must always keep an eagle eye on project total estimated cost since an investment increase causes your amortization ratio to decrease. You should strive to maintain a comfortable ratio above 1.0. In Step V, if your project does not amortize and savings have been maximized, you may find it beneficial to reduce scope. If so, recheck your projected savings to be sure they are still valid.

During and After Construction

During construction, changes in design requirements are going to occur. However, construction managers should be keenly aware that a costly change order may increase investment costs to the point where a project no longer amortizes. Once a project has a low acceptable bidder, then the leeway for change orders can be determined, provided your bid price is lower than the approved cost of your project. A wise approach would be to always minimize change orders for amortization projects.

After construction is complete, certain related actions must come to pass based upon your project economic analysis. In short, saving generators must have a chance to work. Manpower actions are a prime example. If a newly constructed facility enables the elimination of personnel positions from an organization's unit detail listing, then manpower actions to drop slots

(cont'd on page 36)

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Strategic Air Command has been designated as the lead command to investigate ways to improve roof management. Since 1975, SAC and a consultant firm have surveyed the built up roof (BUR) problem and have been developing a program to regain control of BUR construction. SAC is establishing a reputation as a buyer who can and does demand . . .

Good Quality in Roof Construction

by Maj Richard H. Wyatt, PE, and Michael R. Toriello, EIT

Historically, the past Strategic Air Command (SAC) built-up roofing (BUR) policy has resulted in poor quality construction; $3 to $4 million have been spent annually on the procurement of "so-called 20 year roofs" that have frequently failed before five years of service. The life expectancy of SAC roofs is estimated to be 12 years. The problem is prevalent in both new construction and in roof replacements on existing buildings.

Priority considerations should be given to sloping roofs with application of shingle or built-up roofing, whichever is applicable, when designing new construction. For maintaining existing roofs where structure and span permit, consider retrofitting with a hip, shed or gable type roof system. When sloping roofs can be integrated into new or existing building designs in a manner that will produce an attractive facility compatible with the surrounding community and prevailing climate, they should be considered.

SAC's experiences are not unique. Poor quality control in the BUR industry is a national phenomenon, the responsibility for which is divided among the industry itself, manufacturers and contractors, and the architectural/engineering community. Traditionally, engineers have relied upon the industry to provide the quality control, and in the early years, 1920-1940, before the courts ruled that manufacturer control of contractors was in "restraint," such reliance was justified. Then, during the building boom of the 1950s and 1960s, manufacturers departed from the basic BUR design in an attempt to shortcut material and labor costs inherent in the basic system.

Because the public recognizes and demands a level of quality, manufacturing industries use strict quality control in their production. However, several factors have resulted in laxity on the part of the BUR industry to operate under such a mandate. Experience has indicated that engineers do not necessarily recognize quality roofing nor do they know how to measure it; therefore, they are not in a position to demand quality.

Preoccupation with initial costs and construction speed, combined with the Government's reluctance to enforce contractor and manufacturer accountability for quality, has further diminished the quality of roofing construction.

The really conscientious contractors, who expend the time and money necessary to assure a quality roof, are priced out of Government contract work by many roofers who specialize in low-cost, high-production, but inferior work. These contractors operate with virtually no threat that they will be held accountable for the performance of their end product. In many cases, the same roofer has roofed and reroofed the same building within a 3 to 10 year period, each time with a 20 year roofing system!

With over 70 million square feet of BUR in place, SAC has been in desperate need of a program to combat the situation. The existing roof inventory, valued at over $200 million in replacement costs, is depreciating at a rate of eight percent ($16 million) per year rather than the five percent ($10 million) inherent in a 20 year life cycle cost. This amounts to a depreciation rate of 60 percent higher than should be expected and is an unwarranted excess depreciation cost of over $6 million per year for SAC and the taxpayer.

Recognizing the potential benefits and savings, HQ USAF/PREM has designated SAC as lead command to investigate ways to improve roof management. The SAC Engineering and Services and Procurement staffs, with the assistance of Construction Consultants Incorporated of Detroit, Michigan, since June 1975, have surveyed the BUR problem and have been developing a program to regain control of BUR construction.

The program assigns the responsibility for the performance of the finished roof to contractors and manufacturers by a specification that provides for:

- Certification by the selected roofing materials manufacturer that his roofing system is appropriate to the particular application involved.
- The inclusion of a Quality Assurance Program, with both Contractor and Government level inspection; the Contractor inspection via a quality controller who will record specific quality control data.
- The mechanics for recognizing and enforcing contract requirements via the technical specification which will be reviewed by all parties, in detail, at a preconstruction conference.
- The Contractor's continuing involvement; the Contractor, as part of the contract, is to respond to, locate, and repair any leaks or defects within 24 hours for a period of five years.

Phased roof construction; felts have been glaze coated and temporary base flashings were installed. The entire roof system (roof membrane and insulation) is highly susceptible to water damage.

Paramount to the success of the program are procedures and training to:

- Assist the engineer in saying precisely what he means in the technical specifications.
- Provide the ammunition by which the contracting officer can enforce these requirements contractually by insuring complete engineer/contracting officer coordination prior to advertising.

Commanders must be aware of the program and the concept prior to entering into such a contract. They must resolve to accept the sometime immediate inconvenience of delay in completion of a project in favor of absolute adherence to sound construction principles.

Construction Consultants, Incorporated (CCI) has developed and employed similar programs in response to roof problems plaguing both private industry and governmental agencies. Many Air Force engineers should be familiar with CCI's philosophy through presentations by the company's

Phased roof construction and poor workmanship; debris left on roof, flood coat ineffective, bare felt exposed. Entire roof system subject to water damage.

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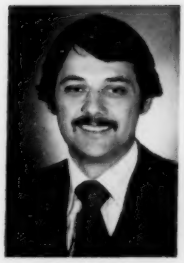
president, Mr Ed Schreiber, at the Air Force Institute of Technology Civil Engineering School short courses, Wright-Patterson AFB, Ohio. In February 1976, field tests were initiated to determine whether CCI's program concepts could be effectively used by Air Force engineers and contracting officers to improve the quality of roofs purchased by construction contract.

Eight projects, totaling over $1 million, were selected at Rickenbacker AFB, Ohio; Dyess AFB, Texas; and Griffiss AFB, New York. Contracts were awarded between June and September 1976. Four contracts are complete and the remainder are in progress. Seven different contractors with varying degrees of roofing competence are involved. Those who have been in the business of building quality roofs have had little problem with the controls stipulated in their contracts. During the 1977 construction season, the tested specifications will be implemented at all SAC bases.

Although there are some additional initial costs anticipated by using the new program contract documents, the expected extended life of the roof far exceeds the value inherent in the increased initial costs, with life cycle costs reduced to an attainable five percent. In 1977, and in the years to come, SAC expects to attract more and more quality contractors and will begin to recoup the millions of



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dollars per year that have been paid in the past for poor quality roof construction. HQ USAF/PREM has tentative plans based on the continued SAC experience to publish directives that will implement these changes as part of a total roof requirement program Air Force-wide in 1979. SAC has begun to establish a reputation with the roofing industry as a buyer who **can** and **does** demand good quality in roof construction. C&S

Forty-four Selected for Promotion to Captain

Forty-four civil engineering and services officers were selected for promotion to captain by the CY 1977A Temporary Captain Promotion Board recently. Of the officers named, 13 civil engineers and three services officers were selected for regular augmentation.

The overall promotion rate of civil engineers was 71 percent and 80 percent for services. Significant characteristics included: all civil engineers with Squadron Officers School (SOS) were promoted and five out of the six with master's degrees or higher were selected. The three services officers with SOS were each promoted, two of them selected for regular augmentation. Selectees are:

*Abbruscato, James L.	Ramstein
Amend, Joseph H., III	AFWL, Kirtland
Arzt, Frederick K.	March
Barthold, Bruce R.	Hurlburt
Behan, James J.	Hurlburt
Bryan, William S., II	Hill
Caples, Buddy C.	Malmstrom
Carson, William J.	Dyess
Connell, James E.	Duluth
Croft, Arthur F.	Lackland
*Dawson, Ernest	Blytheville
*Dowling, David E.	Pease
*Emison, David L.	Pope
Evans, Stephen M.	Ramstein
Gabbard, Vernon, Jr.	AFIT
*Garber, Larry E.	Minot
Grady, Robert M.	Spangdahlem
Hammar, Brian A.	Ellsworth
Handy, John B.	Iraklion
Hipp, Eddie J.	Wright-Patterson
Hughes, James R.	Rhein-Main
*Johnson, Nathaniel	Moody
*Kaya, Melvin S.	Rickenbacker
*Keuper, William R.	Williams
Kinman, Samuel D.	Carswell
Krans, Raymond L.	Patrick
Larsen, Edwin M.	Kunsan
Leavenworth, Jeffrey	Barksdale
*Maguire, Patricia	Bentwaters
McDonald, William M.	Elmendorf
*Meyer, Louis G.	Howard
*Meyers, Kathryn A.	Sembach
Moxley, William C.	Chanute
Neve, Trevor L.	Cape Romanzof
Petitpren, Michael	LAAFS
Ray, Dennis J.	Malmstrom
Rodriguez, Fidel, Jr	Brooks
Shuster, Carl P., Jr	Kincheloe
Singley, John C.	Chanute
Sullivan, Dennis L.	Elmendorf
Truesdale, Robert C.	Arnold Development Ctr
Vanveghel, Stephen	Mather
*Watts, Randal P.	Kirtland
Young, Dale E.	McConnell

*Services Officers.

To conserve fossil fuel resources and combat the spiraling cost of electrical energy, other methods of providing electricity must be developed. One method is the photovoltaic cell which has demonstrated some technical success.

Electricity from the Sun

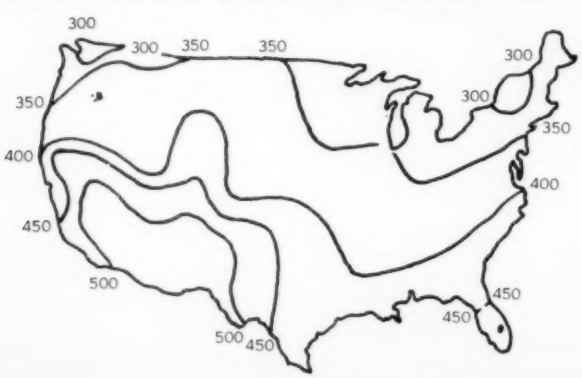
by Capt Anthony Eden, EIT, and Paul F. Neal, PE

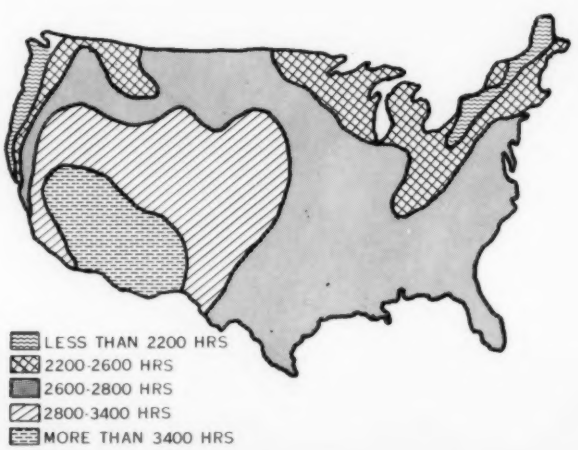
In order to conserve fossil fuel resources and to combat the spiraling cost of electrical energy, other methods of producing electricity must be developed. The photovoltaic (P/V) cell is one such method that has demonstrated some technical success and may have some practical applications in certain areas in the future. The P/V cell uses solar energy for direct conversion to electrical energy. This article will discuss the makeup of the cell and possibilities for future Air Force use.

Sunshine is available for use everywhere in the world; it just varies in intensity and amount. **Figure 1** shows that the level of solar radiation (insolation) received in the United States varies with location and has the greatest potential in the Southern regions of the country. On this figure, insolation is given in Langleys, which equals 4.186 Joules/cm² (1 watt-hr per SF). This information must be coupled with the number of sunshine hours for each location to begin to get a feeling for the possible application of solar energy to the electrical power supply problem. From the figure, it is obvious that the Southwestern part of the United States is a most promising area for the future use of this energy source.

How does a solar cell or photovoltaic cell convert the energy into usable electrical power? Today's typical P/V cell, a silicon wafer, is doped with either boron or phosphorus to create both negative (n) and positive (p) areas in the crystal as shown in **Figure 2**. An electrical grid is added to complete the circuit of the cell. If a photon of light with the correct energy level strikes near the n-p junction, an electron can be knocked loose from the crystalline structure. The "free electron" will tend to move toward a positive "hole" on the other side of the junction. The movement of electrons is the flow of electrical current, and this

Figure 1: United States map, bottom, shows the mean daily solar radiation (Langleys), annual, and the map at the right provides the average number of hours of sunshine per year.





current can then be used to charge a battery or power a DC load as shown in **Figure 3**. A blocking diode is necessary to avoid the discharge of the battery through the cells at night.

This relatively simple setup of components is all that is needed for electrical power generation with a P/V cell. The output is direct current (DC); therefore, alternating current (AC) loads would require conversion equipment. The solar energy supplying power is variable over the span of a day with the peak occurring near noon. The n-p junction has a certain resistance to the flow of electrons and not all the "free electrons" actually find the "holes" across it. Also, if a photon of a slightly higher than required energy strikes the cell, heat is generated. Thus, with internal resistance, collection inefficiency, and heat generation, the maximum possible efficiency from

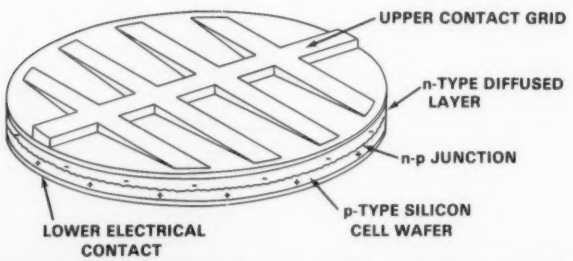


Figure 2: Wafer-thin solar cells can be made from various semi-conductor materials, but most use high purity silicon crystals. Sunlight photons absorbed in solar cells are converted to electricity when an electrical load is connected.

silicon P/V cells is 26 percent theoretically, but closer to only 13 percent in actual practice on the surface of the earth. If the amount of insolation is known from figures such as **Figure 1**, then the amount of electricity to be expected at peak power production can be predicted. Manufacturers provide maximum power curves such as **Figure 4** to allow for the design of P/V circuits and to determine the number of cells needed. These curves are for specific insolation levels and should be adjusted for levels anticipated at a proposed site. Specific application requirements for current, voltage or power can be met by various combinations of cells in series, parallel or units of standard panels prefabricated by manufacturers.

With a basic understanding of P/V cells, let's now take a look at the possibilities of present and future Air Force application of these cells. Our present criteria for Air Force funding of energy conservation projects dictate that the project must not only conserve energy, but must also have a reasonable payback period. The present average cost of $200 per watt for P/V cells rules out their use as energy savers, because other projects can save more at a lower cost. To qualify

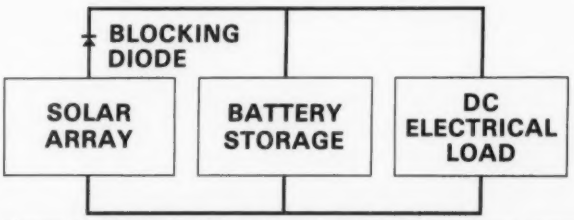
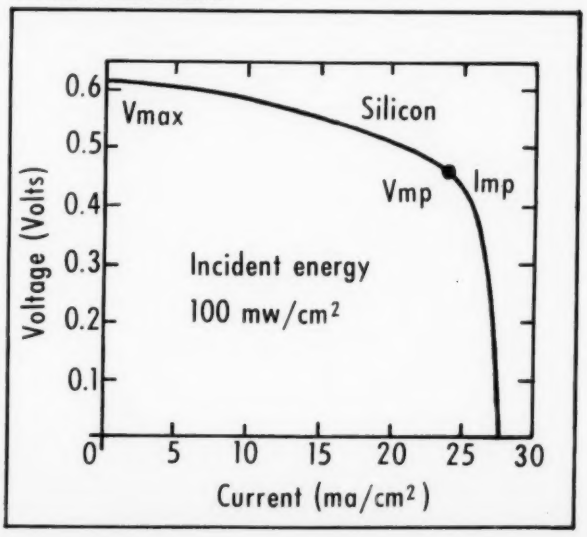


Figure 3: Configurations of solar cell power systems vary with applications, but most have basic components as shown in diagram. Power conditioning equipment and utility grid or other backup power source are provided when both AC and DC loads are involved.

under normal funding, the use of P/V cells must be cost effective over the life cycle of the equipment. The cost of generating electricity with P/V cells in an area of average sunlight over a period of 15 years is approximately $.86 per KWH, exclusive of operating and maintenance costs. With the present cost of electrical energy from commercial sources less than $.03 per KWH, it is not economically feasible now to consider the use of P/V cells.

What are the prospects of future Air Force use of P/V cells? The answer to that question depends on several factors which cannot be answered at this time. From the preceding, it can be seen that the price of the cells must be reduced in order to make them cost competitive with other methods. This could be done by better manufacturing techniques and discoveries of more efficient and cheaper materials. A greater market demand for P/V cells will go a long way in bringing about price reductions. US Army Mobile Equipment Research and Development Command (MERADCOM) has demonstration systems ranging in sizes

Figure 4: Manufacturers provide maximum power curves to allow for the design of P/V circuits and to determine the number of cells needed.



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from 30 watts up to 10 KW under test with actual loads. These tests have been underway for approximately one year. The Energy Research and Development Administration (ERDA) plans to install P/V cells in two houses in the near future. Although very limited in scope, these tests should provide much valuable information regarding performance of P/V cells under different environmental and weather conditions. It also will tell us more about maintenance and operating costs, and the life and durability of the cells. If these tests prove favorable over a long period of time, we should be in a much better position to evaluate where P/V cells could be best applied to Air Force requirements.

Another factor that will influence future use of P/V is the state-of-the-art of other methods for generating electricity. Research and development is being conducted in alternative sources of energy such as nuclear fusion and the breeder reactor. A major breakthrough in one of these areas could delete or delay any further considerations for P/V cells.

The energy situation throughout the world is critical. We must continue to research every possible avenue. The source for P/V cells is eternal; the supply clean and inexhaustible. Even though the use is not feasible at this time, we must keep abreast of the development and be ready to take advantage of this emerging technology at the appropriate time. C&S

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Bolling AFB, Keesler AFB Take Top Honors in Hennessy Competition

Bolling AFB, Washington DC and Keesler AFB, Mississippi, shared top honors in the 21st annual worldwide Hennessy Trophy Competition held in Chicago recently.

Bolling AFB took the coveted first place in the single dining facility category with equal honors going to Keesler AFB in the multi-facility competition.

Dining facilities are judged in 60 areas, including such responsibilities as food preparation, serving techniques and customer acceptance. Both winners earned an "excellent" rating in all areas. Evaluators were especially impressed with the "overall cleanliness" of Bolling AFB's dining hall and the degree of customer service at Keesler AFB.

Trophies for second place were presented to Warren AFB, Wyoming and Maxwell AFB, Alabama, for the single and multi-facility categories, respectively.

The Hennessy Award Program, initiated in 1957, involves a worldwide effort aimed toward excellence in Air Force food service. It is jointly sponsored by the Air Force and the National Restaurant Association in conjunction with the International Food Service Executives Association and the National Industrial Cafeteria Managers Association.

The award is named for the late John L. Hennessy who was regarded as one of the nation's most capable and respected hotel/restaurant executives and who, through his talents and efforts, established task groups to improve the efficiency and economy of military food service.

Eight enlisted personnel were also named the recipients of "Outstanding Food Service Airmen" awards at the National Restaurant Association-hosted awards luncheon. Honored for being "tops in food service" in their respective commands were MSgt Larry R. Renninger (AAC); 2Lt Zachery Green (ADC); Mr John D. Chilia (AFLC); TSgt Franklin P. Losito (AFCS); SSgt John P. Wendzonka (PACAF); SSgt Michael F. Miller (TAC); TSgt Eddie R. Pace (USAFE); and MSgt Wendell G. Mankins (USAFSS).

LESSONS LEARNED

COMMISSARY DESIGN & CONSTRUCTION

A large scale, nationwide commissary improvement and new construction program is under way using surcharge funds with potential for significantly improving the well-being of Air Force families. The Air Force Commissary Service, Kelly AFB, Texas, has the overall responsibility for the design and construction of this program. The concurrent design of 12 new large commissaries and the alteration of many existing stores will require great care by architects and engineers at base level to avoid previous mistakes. In the examples which follow the comment in boldface type represents a problem that was actually experienced on an Air Force installation. The comment in the lighter face type represents the actions which should be taken to prevent the kinds of problems that have delayed projects in the past or have caused unnecessary maintenance problems.

PROBLEM: Numerous stores upgraded without making them accessible to the handicapped. GAO team caught us—embarrassment all around.

All commissary projects, either new construction or major alteration, are to provide full accessibility for physically handicapped customers and employees. Designers must be fully aware of the requirements of Standard A117.1 of the American National Standards Institute (ANSI) and use all applicable parts of it in designing a commissary.

PROBLEM: Alteration and addition design discarded at 65 percent point. Phasing of construction would not permit store to remain open.

Construction must be phased in such a way that the commissary can remain open and provide as complete a service as possible. Work should be clearly established and identified so that commissary personnel and construction contractor personnel have a complete understanding of the areas involved during each phase of the construction. By doing so, operation of the store can be worked around the disrupted areas.

PROBLEM: Cold drafts on cashiers resulted in labor union grievances and Congressional interest.

Because of high traffic flow in commissaries, many vestibules are ineffective because the interior and exterior doors are frequently open at the same time and remain open for extended periods of time. To offset this condition and provide better control of the interior environment, recommendations are that all doors should be single rather than double doors; the distance between interior and exterior doors should be increased; and the doors should be offset or at 90 degrees instead of in line, to form a barrier to direct wind infiltration. In severe cases, it may even be necessary to install infrared radiant heaters to warm the checkout counter area to offset the impact of infiltration from frequently used exit doors. Consider grouping exit doors at one end of the checkout area rather than having them directly opposite the checkout lines.

PROBLEM: Small wheeled, heavy forklift vehicles crack warehouse floors.

The warehouse areas of commissaries are being subjected to heavier loads as a result of increased stacking heights and narrow aisles, both of which have resulted from new equipment that is used for storage and retrieval of supplies. Floor slabs must be designed to support the greater loads. Accurate assessment of the live loads and dead loads must be made to provide the structural engineer with valid design loads.

PROBLEM: Refrigerated cases and related equipment arrived 12 months after construction completion.

The prime contract should include all major equipment. Government furnished equipment should be avoided.

PROBLEM: Meat cutting room was built without floor drains—bloody mess; expensive correction.

The areas that require floor drains should be identified early in the design stage so that the locations can be coordinated with all other design specifications. The selection of drains must take into consideration the types of loads they will be subject to from heavily loaded carts, forklifts or dollies. The same type of consideration must be given to the design of trench covers so they do not become deformed and become barriers to carts.

PROBLEM: Refrigeration compressor location was revised during construction due to appearance. The revision was costly and didn't work.

The optimum location of the mechanical equipment room and refrigeration equipment room must be determined by evaluating all factors that impact on the efficient operations and maintenance of the mechanical systems. Other important considerations are noise and vibration isolation, energy efficiency through recovery of rejected heat and architectural appearance of exposed mechanical systems. The length of refrigeration piping should be held to a minimum and this will often dictate the best location for refrigeration equipment. No compromise of efficient operation should be made for the

sake of appearance. Efficient operation of systems should dictate the location of equipment rooms. Architectural consideration is to be given to conceal equipment if it is located on the exterior of the facility.

PROBLEM: Paths in the floor finish were well-worn within 12 months of the grand opening.

The floors in various parts of a commissary receive exceptionally hard use and require special attention during design to select the most suitable finish. Careful inspection should be made during construction to insure proper installation of the selected finish. The area where customers are channeled through the checkout counters received extremely hard wear. Resilient floor tile does not hold up in these areas and should not be used. A hard finish such as quarry tile or terrazzo tile is a better selection and will give better service and retain an attractive appearance. Warehouse floors that are subject to heavy loads require a slab that will hold up under heavy loads and various types of wheeled vehicles.

PROBLEM: Doors and walls have the appearance of shrapnel hits.

Appearance and maintainability are important factors to be considered in selecting wall finishes. Walls that are subjected to impact from carts are especially critical. They should receive special attention both in the selection of a finish material and in providing a curb or rail that will absorb the impact from carts and retain an acceptable appearance while protecting the wall. Doors also require protection and should be designed to absorb impact from carts without impairing their appearance. This is especially critical for doors between the sales area and the backup storage areas.

E&S

Focus On *(cont'd from page 15)*

colonel (promotional opportunity 70%) and even less competitive to colonel.

Several points about the new OER should be kept in mind. Promotion boards use the "whole person" selection concept. Therefore, the boards evaluate an officer's entire record which consists normally of many years of documentation (OERs, experience, jobs, etc.). An officer who is assigned to a selectively manned organization and who has received a "3", may get promoted at a higher rate than an officer who receives a "3" assigned to a non-departmental/joint assignment. Eventually, most officers will have a mixture of ratings. If an officer received a "3," then later a higher rating in the same job, the question arises: which OER would bear the most weight in the mind of a promotion board member? Actually, it cannot be determined by fact, but it is reasonably logical to assume that it would be the higher rating and latest OER. The new OER system allows an officer to increase his competitiveness quicker than the old system. Finally, if an officer receives a "3," he should not call PALACE BLUEPRINT to request a new assignment. Instead, he should initiate self-improvement efforts (PME, advanced academic degrees) and, most importantly, he should continue to perform to the best of his ability. **The most important job you will have is the one you have now.** Remember, performance is the key.

Summary

Each officer should always remember that competitiveness is ongoing and it can change rapidly. An officer's competitiveness can be increased by several approaches, the most significant include:

- **An outstanding OER which documents exceptional performance in a tough job and shows great potential;**
- **Completion of a PME School by correspondence seminar or in-residence;**
- **A usable graduate academic degree program; and**
- **Receipt of an award.**

Keep your records current to include an updated representative picture. **Now is the time to start increasing your competitiveness!** E&S

The World of *(cont'd from page 28)*

should become effective the day the using agency occupies the new building. As an added comment, the using agency **must** be aware that project approval and construction will eventually result in manpower reductions as specified in the economic analysis document. Further, if maintenance costs will be saved by constructing a replacement structure, then the base must not spend anymore maintenance/repair funds against that old structure. In many cases, the old facility should be considered for prompt disposal action. The new certification of savings statement now required will go a long way in ensuring that the using agencies and commanders understand the required actions needed to make P341 savings become a living reality.

Conclusion

The thrust of this presentation has been to emphasize the necessity for an organized approach to discover saving situations. You need to have the differential savings concept firmly implanted in your thinking. It is your economic tool. Just as a design engineer needs an understanding of stress equations to properly size structural members, in like manner, the economist should know the mathematical concepts that generate cost savings. It is straight deductive reasoning. You are given the premise that gives savings; your task is to be sensitive to the real world cost situations that will comply with this savings concept. It is not hard.

Engineers win 5 SAME Awards

Air Force Civil Engineers were presented distinguished awards and were named to various national offices within the Society of American Military Engineers (SAME) during the Society's 57th annual meeting in San Francisco in late April. In addition, it marked the conclusion of the one-year presidency of the multi-service organization by the Director of Engineering and Services, Headquarters US Air Force.

Awards presented and Air Force recipients included:

Newman Medal: Lt Col William R. Sims, Staff Architect Planner, Environmental Planning Division, Directorate of Engineering and Services, Headquarters US Air Force. Colonel Sims was cited for his leadership, initiative and foresight which resulted in significant contributions to the effectiveness and success of the Air Force mission and accomplishment of national environmental goals. The benefits derived from his new concepts and developments in engineering planning and decision making of national defense proposals will continue to be apparent in the foreseeable future.

Gold Medal: Mr John W. Ward, Jr, Congressional Liaison Representative for the Directorate of Engineering and Services, Headquarters US Air Force. Mr Ward was recognized for distinguished service for his support of the Society as National Treasurer, Chairman of the Finance and Employees Retirement Fund Committees, and as committee chairman for the 1976 annual meeting held in Washington DC. The Gold Medal is the oldest award of the Society, having been presented annually since. 1920.

Tudor Medal: Mr James R. Van Orman, Chief, Systems Division, Directorate of Facilities and Systems, Air Force Civil Engineering Center, Tyndall AFB, Florida. Mr Van Orman was honored for his dedicated efforts and military engineering achievements in the interests of national efforts. He is credited with the initiation and operational testing of a system to disperse warm fog at high traffic/wartime critical airfields which will allow aircraft launch and recovery operations to continue in adverse weather.

Goddard Medal: SMSgt Larry J. Frick, Structural Superintendent, 7625th Civil Engineering Squadron, US Air Force Academy, Colorado. Sergeant Frick was instrumental in supporting the admittance of women cadets through timely completion of major construction efforts. He instigated and managed major Academy facility improvements while realizing significant productivity achievements in five shops, totaling 103 personnel.

Curtin Award: 341st Civil Engineering Squadron, Malmstrom AFB, Montana. The distinctive contribution to mission support and meritorious service according to the highest professional standards have earned the respect and admiration of their associates.

In other business, **Maj Gen Robert C. Thompson,** national President of the Society for 1976-77, presented the president's gavel to Mr Seymour S. Greenfield, partner, Parsons, Brinckerhoff, Quade and Douglas, New York City. Air Force personnel appointed to the Executive Committee by the new President included **General Thompson, Maj Gen William D. Gilbert** and **Mr. Ward.** Mr Ward was reelected as National Treasurer for 1977-78.

Maj Eugene A. Lupia, Special Assistant to the Director of Engineering and Services, was elected a director for one year and **Col Robert M. Iten,** Commander, Air Force Civil Engineering Center, was elected a director for three years.

Appointed as Vice-Presidents-at-Large were **Col William L. Deneke,** Air Force National Guard Bureau, and **Lt Col Matthew M. Cafiso,** Air Force Reserve. E&S

NEWMAN MEDAL
General Thompson Lt Col W.R. Sims

GOLD MEDAL
J. W. Ward S. S. Greenfield

AFCE's Accept SAME Awards; Others Named to Various Positions

(See related article page 37)

TUDOR MEDAL
Col R. M. Iten (for J. R. Van Orman) L. W. Riggs

GODDARD MEDAL
Brig Gen H. O. Johnson (Ret) SMSgt L. J. Frick

S.S. Greenfield Gen Thompson

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